ARCADIS
Infrastructure · Water · Environment · Buildings

Imagine the result

Madison Kipp Corporation

Site Investigation Work Plan

Madison-Kipp Corporation
Madison, Wisconsin

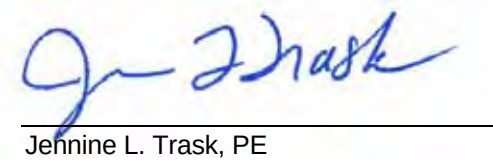
BRRTS No. 02-13-001569
Facility ID No. 113125320

May 2012

ARCADIS

Toni Schoen
Senior Geologist

Edmund A. Buc, PE, CHMM
Principal Engineer



Jennine L. Trask, PE
Project Manager

Site Investigation Work Plan

Madison-Kipp Corporation
Madison, Wisconsin

Prepared for:
Madison-Kipp Corporation

Prepared by:
ARCADIS U.S., Inc.
126 North Jefferson Street
Suite 400
Milwaukee
Wisconsin 53202
Tel 414 276 7742
Fax 414 276 7603

Our Ref.:
WI001283.0001

Date:
May 31, 2012

ARCADIS

Table of Contents

Tables

Figures

Appendices

Executive Summary

On behalf of Madison-Kipp Corporation, ARCADIS has been retained to support investigation and remediation activities at its facility located at 201 Waubesa Street in Madison, Wisconsin (Site). The Site is approximately 7.5 acres in size. A 130,000-square foot building occupies much of the Site, with asphalt parking lots located in the northeastern, southwestern and southeastern portions of the Site. The building has a 25,000-square foot second floor and a 25,000-square foot basement. The Site is currently used as a metals casting facility.

The Site is located in the eastern portion of Madison, in a mixed use area of commercial, industrial and residential land use. The Site is also located at the northeast end of the Madison isthmus, approximately 1,500 feet north of Lake Monona and approximately 6,800 feet east of Lake Mendota.

Site investigation activities were initiated in 1994 in response to a request from the Wisconsin Department of Natural Resources (WDNR). Site investigations had been conducted at two adjacent properties. The results of an investigation in 1986 at the Kupfer Iron Works site located north of the Site identified trichloroethene (TCE) in shallow groundwater at a concentration of 1.6 micrograms per liter (µg/L), with groundwater flow to the west-southwest. A separate investigation at the Madison Brass Works facility located west of the Site identified tetrachloroethene (PCE) in shallow groundwater at a concentration of 11 µg/L and TCE at 1.3 µg/L. Groundwater flow at the Madison Brass Works was also reported as west-southwest.

The initial investigation at the Site identified chlorinated hydrocarbons in soil and groundwater. Additional investigation activities were conducted, and are still ongoing. A review of historical facility operations during the investigation identified the following potential source areas:

- A PCE aboveground storage tank was located along the northeast exterior of the building. A drainage ditch near this area extended northward. Elevated concentrations of PCE were detected in soil samples collected from along the ditch, with the highest concentrations located at the northernmost tip of the building.

- Two vapor degreaser vents discharged condensate to the exterior of the building. One vent was located along an east exterior wall of the northern portion of the building. A second vent was located along an east exterior wall

of the central portion of the building, near the east property boundary. Elevated concentrations of PCE were detected in soil samples from both areas.

- Oils were spread in the north parking lot to control dust in the years prior to paving the area. Because these were oils from facility operations, and because polychlorinated biphenyls (PCB)-containing oils were utilized in the past, it is considered possible that PCBs are present beneath the pavement. Soil samples collected from excavated soil during installation of a vapor extraction system in 2012 contained PCBs.

- A Phase I Environmental Site Assessment (ESA) of the Site drafted but not finalized in 2010 identified a gasoline service station formerly located on what is currently the southeast parking lot of the Site (northwest corner of Atwood Avenue and Marquette Street). Two monitoring wells (MW-6S and MW-6D) located in the southeast portion of this parking lot contain petroleum volatile organic compounds (VOCs) consistent with a gasoline release.

- The Phase I ESA also identified a former Clark service station, located at 2801 Atwood Avenue as an active remediation site. The former Clark service station was located directly south of the Site across Atwood Avenue. As noted above, monitoring wells located in the southeastern corner of the Site contain petroleum VOCs.

- Groundwater impacts are present at MW-2D. Soil samples were collected from a nearby boring (GP-7) during an early phase of investigation. The soil samples were field screened, but not submitted for analytical testing.

Through April 2012, 21 groundwater monitoring wells have been installed to evaluate groundwater quality, and over 100 soil borings have been advanced to evaluate soil quality. Vapor sampling was initiated in 2004 to evaluate the vapor intrusion pathway. Vapor sampling has been completed along the perimeter of the Site and sub-slab and indoor air sampling has been completed at residences adjacent to the Site. Several phases of remediation have been implemented to address the identified impacts in soil and groundwater. Enhanced biodegradation was implemented at the two former vapor degreaser vent areas and the former drainage ditch to address impacted soil. Post-remediation sampling indicated that the remedy was successful at decreasing VOC concentrations. An ozone sparge system was installed in 2008 to remediate impacted shallow and intermediate groundwater in the eastern portion of the Site. A soil vapor

extraction (SVE) system was installed in February and March 2012. The SVE system is currently operating.

As part of its activities, ARCADIS has reviewed the historical investigation data and developed recommendations for completing the Site investigation. This report presents a work plan for conducting investigation activities in addition to the *Work Plan for Polychlorinated Biphenyl Investigation* and the *Bedrock Characterization Work Plan* submitted to the WDNR on May 21 and 22, respectively. Work will include the collection of groundwater samples from 37 direct push soil borings, installation of six additional piezometers, collection of groundwater samples from the new and existing monitoring wells and piezometers, and collection of soil vapor samples. The work plan proposes the following investigation activities:

- Thirty-seven borings will be advanced to a depth of 35 feet or to the top of bedrock, to further delineate VOC concentrations in groundwater. These borings are being advanced as part of an investigation to evaluate PCBs in soil, and will be used as part of this investigation to evaluate VOCs in groundwater.

- Installation of six additional piezometers to further evaluate the vertical and lateral extent of chlorinated VOC groundwater impacts. Two nests of two piezometers will be installed. One nest will be installed off-site to the southeast and the second nest off-site to the east. One off-site piezometer will be installed west of the Site. A deep piezometer will be installed at the existing MW-6 well nest.

- A round of groundwater samples will be collected from the new and existing wells for analysis of VOCs, polycyclic aromatic hydrocarbons, PCBs, dissolved Resource Conservation and Recovery Act metals, and total cyanide.

- A round of soil vapor samples will be collected from the existing network of soil vapor probes on the Site.

- The results will be presented in a site investigation report.

The work outlined above will be conducted in conjunction with investigation activities proposed in the *Work Plan for Polychlorinated Biphenyl Investigation* and the *Bedrock Characterization Work Plan*. The *Work Plan for Polychlorinated Biphenyl Investigation*

presented a scope of work for evaluating PCBs and other constituents in soil as requested by the WDNR. The *Bedrock Characterization Work Plan* presented a scope of work for evaluating the vertical extent of groundwater and characterizing the bedrock. As part of this work plan a deep piezometer is proposed at the Monitoring Wells MW-3 and MW-5 well nests. The results from the three investigations will be presented in a single site investigation report.

This document was prepared in accordance with NR 716, Wis. admin. code. An NR 712.09 submittal certification is included in Appendix A.

1. Introduction

ARCADIS has been retained to assist the Madison-Kipp Corporation with environmental investigation and remediation activities at the facility located at 201 Waubesa Street in Madison, Wisconsin (Site). Environmental investigation and remediation activities have been ongoing since 1994. These historical activities focused on the use and potential releases of tetrachloroethene (PCE). Several phases of investigation have evaluated the presence and extent of PCE in soil, groundwater, and soil vapor/indoor air.

The historical investigation and subsequent remediation activities were conducted in phases, and addressed discrete areas. At the request of Madison-Kipp Corporation, ARCADIS has reviewed the historical investigation results. The purpose of the evaluation was to develop a comprehensive approach to investigate site conditions, so that a conceptual site model can be developed to describe site-wide, soil, groundwater and vapor conditions. This conceptual site model will then be used to assist with developing a comprehensive remedy.

This report presents a work plan for continuing the site investigation. The information provided herein is based on the requirements of NR 716, Wisconsin administrative code A NR 712.09 submittal certification is included in Appendix A.

2. Project Background

2.1 Site Location, Contacts, and Description

The Site is located at 201 Waubesa Street in Madison, Wisconsin. The Site is located in the southwest quarter of Section 5, Township 7 North, Range 10 East in Dane County. The location of the Site is illustrated on a topographic quadrangle presented as Figure 2-1.

The following contact information is provided for the facility and environmental consultant:

Facility Representative:	Mark W. Meunier, SPHR Madison-Kipp Corporation 201 Waubesa Street Madison, Wisconsin 53704 608-244-3511 (telephone) 608-770-9401 (fax) mmeunier@madison-kipp.com
Environmental Attorney:	David A. Crass Michael Best & Friedrich, LLP One South Pinckney Street, Suite 700 Madison, Wisconsin 53703 608-283-2267 (telephone) 608-283-2275 (fax) dacrass@michaelbest.com
Environmental Consultant:	Jennine L. Trask, PE ARCADIS U.S., Inc. 126 North Jefferson Street, Suite 400 Milwaukee, Wisconsin 53202 414-276-7742 (telephone) 414-277-6203 (fax) jennine.trask@arcadis-us.com

The Site is approximately 7.5 acres in size. A 130,000-square foot building occupies much of the Site. Asphalt parking lots are located in the northeastern, southwestern and southeastern portions of the Site. The building has a 25,000-square foot second

floor and a 25,000-square foot basement. Figure 2-2 depicts the layout of the Site. The Site is zoned M-1 (industrial/manufacturing). The Site is currently used as a metals casting facility.

The Site is located in the eastern portion of Madison, in a mixed use area of commercial, industrial and residential land use. The Site is bounded by a bicycle trail (Capital City Trail) to the north, Atwood Avenue to the south, and Waubesa Street to the west. Residences are located adjacent to the east and west sides of the Site, and further west (across Waubesa Street) and east (across Marquette Street). Commercial properties are located to the south (across Atwood Street) and further east. The Goodman Community Center is located to the north (across the Capital City Trail).

The Site is also located at the northeast end of the Madison isthmus, approximately 1,500 feet north of Lake Monona and approximately 6,800 feet east of Lake Mendota. The topography of the Site is relatively flat, with an elevation ranging from approximately 870 to 880 feet above mean sea level. The Site and surrounding area is serviced by municipal water supply and sewerage systems.

2.2 Hydrogeologic Conditions

2.2.1 Geology

The Madison area lies in a part of Wisconsin underlain by a thick sequence of Paleozoic sedimentary rock that was deeply eroded during Pleistocene glaciations. In the vicinity of the Site, bedrock surface lies beneath approximately 35 feet unconsolidated glacial sediments. Clayton and Attig (1997) have mapped the glacial sediments in the Site vicinity as a patchwork of glacial lake sediments (e.g., stratified sand, silt and clay) and till (much denser and poorly sorted gravelly, clayey silty sand). Soil borings completed at the Site describe the unconsolidated zone as a fining-upward sequence consistent with lake sediments. The typical unconsolidated stratigraphy includes:

- A veneer of surficial fill, generally less than 5 feet thick.
- Clay or silty clay, from approximately 5 to between 10 and 15 feet below ground surface.

- Sand, from approximately 10 feet to the top of rock at approximately 35 feet. The sand is typically fine-grained and variably silty, with occasional gravel beds, particularly in the bottom half of the unit.

While the sedimentary bedrock in the Madison area is nearly flat-lying, the bedrock surface was deeply eroded by glaciers. Lakes Mendota and Monona, located to the north and south of the Site, respectively, occupy deep glacial valleys that were scoured into bedrock at least 200 feet deeper than the bedrock surface at the Site (Bradbury and others, 1999).

The Site vicinity is underlain by approximately 750 feet of Cambrian-aged sandstone, shale and dolomite. The expected stratigraphy at the Site is as follows (Ruekert/Mielke, 2011):

Estimated Depth	Formation/ Group	Description
35-120 feet	Tunnel City Group	Poorly to moderately-well cemented fine-to-medium sandstone, often Glauconitic (containing green/blue sand-sized clay nodules).
120-245 feet	Wonewoc Formation	Medium to fine-grained sandstone
245-430 feet	Eau Claire Formation	The upper part of contains significant shale and siltstone. Deeper, the unit is chiefly dolomitic sandstone.
430-750 feet	Mount Simon Formation	Well-cemented, coarse to medium-grain sandstone

The hydrostratigraphy of the area is typically divided into four units:

- **Unconsolidated Zone (Upper Unconsolidated Aquifer)**, the zone of saturated glacial sediments overlying bedrock. At the Site this zone is discontinuous. The zone of saturation is thin to absent in the southern part of the Site (e.g., the water table is at or below the rock surface), to between 10 and 15 feet thick in the north of the Site. Typically, only the sandy portion of the unconsolidated zone is saturated, while the shallow clay is above the water table.

- **Upper Paleozoic Aquifer (Upper Bedrock Aquifer)**, encompassing the Tunnel City Group and Wonewoc Formation (approximately 210 feet total thickness). The unit is not used extensively for water supply, but is moderately

permeable, with a hydraulic conductivity estimated at approximately 5 feet per day (Ruekert/Mielke, 2011).

- **Eau Claire Aquitard**, defined as the thin shaley facies found near the top of the Eau Claire Formation. Where present, this unit functions as an aquitard separating the Upper Paleozoic Aquifer from the Mt. Simon Aquifer below. The Eau Claire is present in the immediate Site vicinity, but is eroded in the glacial bedrock valleys beneath Lakes Monona and Mendota.

- **Mount Simon Aquifer (Lower Bedrock Aquifer)**, defined as the Mount Simon and Eau Claire Formations, starting below the Eau Claire Aquitard (approximately 500 feet total thickness). The Mt. Simon Aquifer is the chief water-supply aquifer in the region, and is the unit pumped by the city of Madison water-supply wells. The mean hydraulic conductivity of the aquifer is estimated at approximately 10 feet per day (Bradbury and others, 1999).

Though the sandstone aquifers have moderate porosity (typically 10 to 20 percent), the groundwater flow occurs predominantly in fractures such as bedding planes and joints. The porous matrix of the sandstone creates a secondary permeability, and provides a significant volume of storage.

The water table at the Site generally ranges between 15 and 35 feet below ground surface. Previous reports have shown shallow groundwater flow trending to the east and south; flow in the bedrock appeared to trend south, but has shown more variability than in the upper zones. Based on the groundwater levels measured from nested monitoring wells, the vertical gradient is downwards at the Site. Recently installed wells and additional groundwater level monitoring are anticipated to clarify the patterns of groundwater flow.

2.3 Summary of Previous Investigations

Site investigation activities were initiated at the Site in 1994, and are ongoing. The following sections present an overview of the investigations completed to date. The results are generally presented chronologically. The exceptions are the Phase I Environmental Site Assessments (ESAs), drafted in 2002, 2006 and 2010. These reports are discussed first, as they provide background information regarding the Site history and setting.

2.3.1 Phase I ESA

A Phase I ESA was drafted but not finalized by URS in April 2002. An update to the 2002 Phase I ESA was completed by RSV Engineering in 2006, and another Phase I ESA was drafted but not finalized by RJN Environmental Services, LLC in 2010. A copy of the text of the Phase I ESA reports is included in Appendix B.

The Phase I ESA reports indicated that Madison-Kipp Corporation purchased the northern portion of the property in 1898, and the southern portion of the Site in 1917. Development initially consisted of a building at the north end of the Site and a building along Atwood Avenue to the south. Building additions were constructed in several phases, and by 1955 the initial two buildings were connected by these additions. The current configuration of the building was established by 1968.

During the May 2010 site visit for the most recent Phase I ESA, the Site was being utilized as a metals casting facility. Natural gas-fired furnaces were used for melting metals, which are then poured into molds to cast parts. The facility conducts limited post-casting processing of parts. Chemical usage at the facility included chlorine, hydraulic oils, caustic solutions and stoddard solvent. No floor drains were observed in the building. Waste streams consisted primarily of solid wastes such as aluminum byproduct, used steel shot, wastewater sludge, and general refuse.

The Phase I ESAs indicated that groundwater impacts from historical operations had been identified during prior environmental investigation. Fourteen groundwater monitoring wells and four soil vapor monitoring wells were present. In addition, five ozone injection wells were located in a loading dock area along the east side of the Site to treat groundwater. The Phase I ESA reports did not provide any detail regarding the historical investigations.

The 2010 Phase I ESA identified the following recognized environmental conditions (RECs):

- Existing groundwater remediation: Impacts to groundwater from historical releases of PCE. Remediation of impacted soil had been conducted, and an active ozone injection system was present for the remediation of impacted groundwater.

- Sub-pavement polychlorinated biphenyls (PCBs): Although no testing had been completed, it is known that oils were spread in the north parking lot to

control dust in the years prior to paving the area. Because these were oils from facility operations, and because PCB-containing oils were utilized in the past, it is considered possible that PCBs are present beneath the paving.

- Potential asbestos-containing materials (ACMs) and lead-based paint: Due to the age of the building, it is assumed that some ACMs and lead-based paint are present.

- Former on-site filling station: The 1942 and 1950 Sanborn maps showed a filling station on what is currently the southeast parking lot of the Site (northwest corner of Atwood Avenue and Marquette Street). The tanks were located on the west-central portion of the filling station property.

- Former Clark station: The former Clark station, located at 2801 Atwood Avenue was an active remediation site, and was located directly across Atwood Avenue from the Site. Although the station was downgradient with respect to shallow groundwater flow, flow at depth is variable, and the potential is present for contaminants released at the Clark station to have migrated onto the Site.

ARCADIS reviewed the appendices of the Phase I ESAs, and identified the following additional RECs:

- The 1942, 1950 and 1986 Sanborn Fire Insurance maps depict an oil warehouse on the northwestern portion of the Site. The approximate location of the oil warehouse is shown on Figure 2-2.

- The 1942, 1950 and 1986 Sanborn Fire Insurance maps indicate that three 40-gallon chemical carts are present at the Site, but provide no additional information as to the type of chemical.

2.3.2 Site Investigation, 1994 to 1995

Dames & Moore was retained by Madison-Kipp Corporation to conduct a site investigation. Work was initiated in 1994 and a report dated April 20, 1995 was issued. The investigation was initiated in response to a request from the Wisconsin Department of Natural Resources (WDNR). Site investigations were conducted at two adjacent properties. The results of an investigation in 1986 at the Kupfer Iron Works site located north of the Site identified trichloroethene (TCE) in shallow groundwater at

a concentration of 1.6 micrograms per liter (µg/L), with groundwater flow reported to the west-southwest. A separate investigation at the Madison Brass Works facility located west of the Site identified PCE in shallow groundwater at a concentration of 11 µg/L and TCE at 1.3 µg/L. Groundwater flow at the Madison Brass Works was also reported west-southwest. WDNR contacted Madison-Kipp Corporation and requested they conduct a site investigation.

Four soil borings (SB-1, SB-3, SB-4 and SB-5), three direct-push boring/temporary wells (MK-2, MK-3 and MK-6) and one monitoring well (MW-1/SB-2) were installed during this investigation. All were installed in the northern portion of the Site. The boring/well locations are depicted on Figure 2-2. Tables and figures from the 1995 Site Investigation Report are included in Appendix B. The following is a summary of results from the 1995 Site Investigation Report:

- Borings were advanced up to 31 feet below ground surface. Soil consisted of a surficial unit of silt clay extending to a depth of 6 to 8 feet. The silty clay unit graded to a sandy clay, which extended to a depth of approximately 12 feet, where there was a sharp transition to a fine-grained silt sand. The unit was stratified and had appreciable amounts of gravel. Boring SB-2 encountered refusal at 31 feet, suggesting that bedrock may be present at that depth.

- Fill material was encountered at two borings (SB-3 and SB-4), consisting of sand and gravel mixed with cinders and slag. The fill material extended to a depth of 6 feet.

- Groundwater at Monitoring Well MW-1 was located at a depth of approximately 18 feet. Water level measurements were collected from Monitoring Well MW-1 and from three monitoring wells at the Madison Brass Works property to the west. Groundwater flow was reported to the south-southwest.

- One of the three direct-push groundwater samples (MK-2, located immediately northeast of the building) contained chlorinated volatile organic compounds (VOCs), including PCE (860 µg/L), TCE (470 µg/L), cis-1,2-dichloroethene (2,200 µg/L) and vinyl chloride (400 µg/L). This boring/temporary well was located near a former drainage ditch.

- Five soil samples were collected for VOC analysis from Soil Borings SB-1 through SB-5. Each of the soil samples contained PCE at concentrations

ranging from 1.5 to 46 micrograms per kilogram (µg/kg), with the highest concentration present in the sample collected from Soil Boring SB-3. Low concentrations of several other VOCs were also detected.

- Groundwater samples were also collected from Soil Borings SB-1 through SB-5 using a Hydropunch sampler. Each of the groundwater samples contained chlorinated VOCs. The groundwater sample from Soil Boring SB-4, collected from the northeastern corner of the parking lot, contained the highest concentration of PCE (1,000 µg/L). The groundwater sample from Soil Boring SB-3, located southwest of SB-4 contained PCE at a concentration of 190 µg/L, but also contained the highest concentration of cis-1,2-dichloroethene (6,900 µg/L).

- The groundwater sample collected from MW-1 contained PCE at a concentration of 150 µg/L, along with lower concentrations of other VOCs.

Additional investigation activities were conducted in 1995 and were presented in a Progress Report dated March 20, 1996. The 1996 Progress Report indicated that a PCE aboveground storage tank (AST) was formerly located outside the northern portion of the building. The former drainage ditch identified in the 1995 Site Investigation Report was located along the east side of the building and extended from the former AST area northward to the property boundary. According to the 1996 Progress Report, the tank was taken out of service at an unknown date, the ditch was filled and the area was paved in 1995. This area was viewed during a May 2012 site visit. The northern portion of the former ditch area was paved. However, the southern portion of the former ditch area was unpaved and covered with grass and landscaping. A culvert was observed at the south end of this grassy feature, near the former AST location. The location of the former AST and ditch are shown on Figure 2-2.

Seven direct-push borings (GP-1 through GP-6 and GP-8) were advanced in the parking lot northeast of the building, in the vicinity of the former AST and ditch. An eighth direct-push boring (GP-7) was installed on the west side of the building, southwest of the former AST area. Two additional monitoring wells (MW-2A and MW-3) and a piezometer (MW-2) were also installed. These monitoring wells were renamed from MW-2A to MW-2S, MW-3 to MW-3S and MW-2 to MW-2D. The boring and monitoring well locations are depicted on Figure 2-2. Tables and figures from the 1996 Progress Report are included in Appendix B. The following is a summary of results from the 1996 Progress Report:

- Soil and groundwater samples were collected from GP-1 through GP-8. However, the majority of the samples were analyzed via headspace analysis in the field using a field gas chromatograph. All the samples had comparable concentrations of VOCs, ranging up to 107 µg/L in headspace gas. Three soil samples (GP-4, GP-5 and GP-6) were submitted for VOC laboratory analysis. Each contained PCE, with the highest concentration in the sample collected from GP-4 (300 µg/kg). These three borings were located east of the former AST and ditch.

- Monitoring Wells MW-2A and MW-3 are water table wells, and MW-2 is a piezometer installed to a depth of 44.5 feet (15 feet below MW-2A). Piezometer MW-2 is screened within sandstone bedrock.

- A round of groundwater samples was collected from the three monitoring wells and one piezometer in August 1995. Each sample contained one or more VOCs at concentrations above the NR 140 Enforcement Standards (ESs). PCE was detected at the highest concentration, ranging from 90 µg/L (MW-2A) to 2,600 µg/L (MW-3). Monitoring Well MW-3, located east of the former AST, contained the highest concentration of PCE. The groundwater sample from Piezometer MW-2 contained PCE at 1,100 µg/L, which was higher than detected in the companion water table well at this location (MW-2A, 90 µg/L PCE).

- Groundwater flow was reported to the south and southeast. The report noted that hydraulic conductivity testing at the Madison Brass Works site yielded an average hydraulic conductivity of 0.85 feet per day (ft/day) for the silt sand unit.

2.3.3 Investigation Activities, 1996 to 1999

Additional investigation activities were conducted in 1996 and presented in a letter report dated March 18, 1997. The investigation activities included a review of historical information to identify potential sources of contamination, installation of a well nest (MW-4A and MW-4D) along the south property boundary, installation of two direct-push borings (GP-101 and GP-102) for soil sample collection, and the installation of an extraction well (EW-1) for a short-term pumping test. Monitoring Well MW-4A was renamed to MW-4S. The boring and monitoring well locations are depicted on Figure 2-2. Tables and figures from the letter report are included in Appendix B. The following is a summary of results from the letter report:

- A review of historical facility information identified a former vapor degreaser, which utilized PCE. The vent for the vapor degreaser was located in the northwestern portion of the building, along the east exterior wall. Direct-push Boring GP-102 was advanced in this area. The soil sample collected from GP-102 contained PCE at 4,000 µg/kg, TCE at 7,500 µg/kg, and cis-1,2-dichloroethene at 6,300 µg/kg.

- The review also identified a former fuel oil AST location in the northern portion of the building (Figure 2-2). Direct-push Boring GP-101 was advanced near the vent pipe for the former AST. The soil sample from GP-101 did not contain detectable concentrations of VOCs, polycyclic aromatic hydrocarbons (PAHs) or diesel range organics.

- Monitoring Well MW-4S is screened from 35 to 50 feet, and Monitoring Well MW-4D is screened from 65 to 70 feet. Based on the logs, both wells are screened in the sandstone bedrock.

- A round of groundwater samples were collected from the four monitoring wells and two piezometers in July 1996. The concentrations of VOCs at the three monitoring wells and piezometer previously installed were comparable to past results. The highest concentration of PCE continued to be located at Monitoring Well MW-3 (2,000 µg/L). The groundwater samples from Monitoring Wells MW-4S and MW-4D, located along the south property boundary, contained only PCE. Monitoring Well MW-4S contained PCE at1.3 µg/L and Monitoring Well MW-4D contained PCE at 2.1 µg/L. These concentrations exceeded the NR 140 Preventive Action Limit (PAL) of 0.5 µg/L.

- Based on the results collected to date, the report concluded that two sources of chlorinated VOCs were present at the Site: The former PCE AST and drainage ditch, and the vapor degreaser vent.

- A pump test was conducted at Extraction Well EW-1. This well is screened from 10 to 35 feet. An average pumping rate of 0.94 gallons per minute was achieved. Based on the results of the pump test, a hydraulic conductivity of 0.6 ft/day was calculated.

Additional investigation was conducted in 1997. The results were presented in a letter report dated May 30, 1997. Six direct-push borings (GP-9 through GP-11 and GP-18

through GP-20) were advanced around the northern portion of the former drainage ditch, one direct-push boring (GP-17) was advanced at the midpoint of the drainage ditch, and five direct-push borings (GP-12 through GP-16) were advanced in the area of the former vapor degreaser vent. The boring locations are depicted on Figure 2-2. Tables and figures from the letter report are included in Appendix B. The following is a summary of results from the letter report:

- Concentrations of PCE were detected in the soil samples, ranging from nondetect (GP-13 [5 to 7 feet]) to 6,440,000 µg/kg (GP-9 [2 to 4 feet]). The highest VOC concentrations were detected in GP-9, located near the northern tip of the building. Borings advanced immediately south (GP-11) and east (GP-10) contained lower concentrations of VOCs.

- Concentrations of VOCs in the soil samples collected from near the former degreaser vent were lower than the concentrations detected at the north end of the former drainage ditch.

Two additional piezometers (MW-3D and MW-4D2) were installed and sampled in 1999. The sampling results were presented in a letter report dated September 14, 1999. The well locations are depicted on Figure 2-3. Tables and figures from the letter report are included in Appendix B. The following is a summary of results from the letter report:

- Water level data was used to calculate vertical gradients at each of the three nested wells. The vertical gradient in each was downward, ranging from 0.034 foot per foot at Monitoring Wells MW-4S/MW-4D to 0.010 foot/foot at Monitoring Wells MW-4D/MW-4D2.

- Groundwater samples were collected from the well network in February 1998, May 1999 and August 1999. VOC concentrations at Monitoring Wells MW-1, MW-3, MW-2D, MW-4S and MW-4D remained stable, while concentrations in Monitoring Well MW-2S decreased.

- The groundwater sample collected from Monitoring Well MW-3D contained PCE at a concentration of 1,400 µg/L, and the sample collected from Monitoring Well MW-4D2 contained PCE at a concentration of 15 µg/L.

2.3.4 Investigation Activities, 2001 to 2003

Soil remediation activities (described in a later section) were conducted at the former drainage ditch and former vapor degreaser vent in 1998 and 1999. Supplemental groundwater investigation was completed in 2001. Three additional wells (MW-3D2, MW-5, and MW-5D) were installed in March 2001 to further evaluate groundwater conditions in the bedrock. Monitoring Well MW-3D2 is screened from 76 to 81 feet, Monitoring Well MW-5S is screened from 34 to 44 feet, and Monitoring Well MW-5D is screened from 75 to 80 feet. The results of the subsequent groundwater sampling activities were presented in a letter report dated December 27, 2001. The well locations are depicted on Figure 2-3. Tables and figures from the letter report are included in Appendix B. The following is a summary of results from the letter report:

- The water table in the northern portion of the Site is located within the unconsolidated soil, but is located in the bedrock in the southern portion of the Site. As a result, no monitoring wells are screened within the unconsolidated soil in the southern portion of the Site.

- Groundwater flow maps were prepared for the water table in the unconsolidated soil, shallow bedrock and deep bedrock. Groundwater flow in the unconsolidated soil was reported as directly south, while groundwater flow in the shallow bedrock was south-southwest. Groundwater flow in the deep bedrock appeared radial, with flow to the north, west and south.

- Two rounds of groundwater samples were collected from Monitoring Wells MW-3D2 in 2001. PCE was detected at 1,900 µg/L in April 2001 and 450 µg/L in July 2001. VOC concentrations were higher in Monitoring Wells MW-3S and MW-3D, nested with MW-3D2.

- Two rounds of groundwater samples were collected from Monitoring Wells MW-5S and MW-5D. In July 2001, PCE was detected at 520 µg/L in MW-5S and at 8,800 µg/L at MW-5D.

- A subsequent review of facility information following receipt of the groundwater results for Monitoring Well MW-5S indicated that another vapor degreaser and vent were located in the eastern portion of the building, near Monitoring Wells MW-5S/MW-5D.

An investigation was subsequently completed in 2002 to evaluate soil conditions near the second former vapor degreaser vent. Fifteen direct-push soil borings (BE-1 through BE-15) were advanced between the building and east property boundary, north of Monitoring Wells MW-5S/MW-5D. The results were presented in a letter report dated August 30, 2002. The boring locations are depicted on Figure 2-2. Tables and figures from the letter report are included in Appendix B. The borings were advanced to depths ranging from 8 to 23.5 feet below ground surface. Soil samples were collected at 4-foot intervals and field screened. A subset of five soil samples was submitted for analysis of VOCs. PCE was detected in each soil sample, at concentrations up to 782,000 µg/kg (BE-13).

Supplemental soil sampling was conducted at a residential property (150 South Marquette Street) in November 2002 to further evaluate soil conditions east of the former vapor degreaser vent. Five hand auger borings (HA-12 through HA-16) were advanced, and one soil sample from each boring was submitted for VOC analysis. Three soil samples (HA-12, HA-14 and HA-15) contained PCE at concentrations up to 166 µg/kg. The results were reported in a letter report dated January 3, 2003.

Three additional piezometers (MW-5D2, MW-6S and MW-6D) were installed in February 2003 and subsequently sampled. The results were presented in a letter report dated April 17, 2003. The well locations are depicted on Figure 2-3. Tables and figures from the letter report are included in Appendix B. The following is a summary of results from the letter report:

- Groundwater flow in the unconsolidated soil, shallow bedrock and intermediate bedrock was southwest. Groundwater flow in the deep bedrock was south-southwest.

- The groundwater sample from Monitoring Well MW-5D2 contained PCE at 35 µg/L, much lower than the PCE concentrations in the shallower wells nested at this location.

- The groundwater sample from Monitoring Well MW-6S contained PCE at 1.4 µg/L, while the sample from MW-6D contained PCE at 71 µg/L.

2.3.5 Investigation Activities, 2004 and 2005

Supplemental investigation was completed at the eastern former vapor degreaser vent in 2004 and 2005. The results were presented in letter reports dated March 25, 2005

and March 23, 2006. The sample locations are depicted on Figure 2-2. Tables and figures from the letter reports are included in Appendix B. The following is a summary of results from the letter reports:

- Soil samples were collected from two borings (BE-16 and BE-17; later re-numbered as SB5-1 and SB5-2) in 2004 and analyzed for VOCs. The soil samples contained PCE at concentrations up to 9,540 µg/kg.

- Follow-up soil sampling was completed in 2005. Eleven soil borings (SB5-3 through SB5-13) were advanced along the loading dock area where the former vapor degreaser vent was located. These borings were advanced to further delineate VOC concentrations in preparation for remediation.

- An additional eleven shallow borings (BE-21 through BE-31) were advanced north of the loading dock area in 2005, and six soil samples were submitted for laboratory analysis. Five of the six soil samples contained detectable VOCs, with the highest concentrations present at BE-23, approximately 50 feet north of the approach to the loading dock where the former vapor degreaser vent was located. The soil sample from BE-23 contained PCE at 74,000 µg/kg, with samples from borings advanced around B-23 containing lower PCE concentrations.

- Four vapor probes (VP-1S, VP-2S, VP-1N and VP-2N) were installed along the east property boundary. The vapor sample from each vapor probe contained detectable concentrations of VOCs. PCE concentrations were reported up to 48 parts per million by volume (ppmv).

2.3.6 Investigation Activities, 2011

Four additional piezometers were installed and sampled in 2011. Two piezometers (MW-7 and MW-8) were installed at off-site locations to the east, across Marquette Street. A nest of two piezometers (MW-9D and MW-9D2) was installed off-site to the north, just south of St. Paul Avenue. The groundwater samples collected from Monitoring Wells MW-7, MW-8, and MW-9D did not contain detectable concentrations of VOCs. The groundwater sample collected from Monitoring Well MW-9D2 contained several VOCs, including PCE at a concentration of 29 µg/L.

2.3.7 Investigation Activities, 2012

Three additional water table monitoring wells (MW-10S, MW-11S and MW-12S) were installed at off-site locations. Monitoring Well MW-10S is located west of the Site, across Waubesa Street; Monitoring Well MW-11S is located east of the Site, across Marquette Street; and MW-12S is located northeast of the Site, south of the Capital City Trail. The well locations are depicted on Figure 2-3. The April 2012 sampling results are depicted on Figures 2-4, 2-5 and 2-6. A full round of water samples was collected from the 21 Site monitoring wells. The groundwater samples collected from Monitoring Wells MW-10S and MW-11S contained low to nondetectable concentrations of VOCs. The groundwater sample from MW-12S contained PCE at 0.78 µg/L, slightly above the NR 140 PAL. The results for the samples from the previously existing wells were consistent with the historical results.

In Spring 2012, sub-slab and indoor air sampling was completed at the following ten residences located along the eastern portion of the Site:

102 South Marquette Street

106 South Marquette Street

110 South Marquette Street

114 South Marquette Street

118 South Marquette Street

126 South Marquette Street

128 South Marquette Street

130 South Marquette Street

134 South Marquette Street

142 South Marquette Street

The sub-slab and indoor air samples were submitted to the laboratory for the analysis of PCE, TCE, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride. The

indoor air analytical results were compared to the Wisconsin residential action levels for indoor air, and the sub-slab vapor analytical results were compared to calculated screening levels for sub-slab vapor to indoor air in accordance with the guidelines presented in the WDNR's *Addressing Vapor Intrusion at Remediation and Redevelopment Sites in Wisconsin* dated December 2010. The action levels and calculated residential screening levels are based on the U.S. Environmental Protection Agency (U.S. EPA) Residential Air Screening Levels that represent health-protective concentrations that an individual can be exposed to for 30 years for 24 hours a day. None of the VOC detections in the indoor air or sub-slab vapor samples exceeded the Wisconsin residential vapor action levels or calculated residential screening levels.

2.3.8 Off-Site Soil Sampling Program

Soil samples were collected from selected residential properties bordering the Site to the east from 2003 to 2004. Twenty-one soil borings were advanced at the following property addresses using a hand auger: 150, 154 and 162 South Marquette Street. PCE concentrations in the soil samples from these properties ranged from nondetect to 2.68 milligrams per kilogram (mg/kg). The results were presented in several letter reports, including a letter report dated March 25, 2005 (Appendix B). The letter report indicated that a pilot remediation program was conducted at the soil boring location with the highest off-site PCE concentration (HA-25) in December 2004. A reagent, presumed to be similar to the bioremediation reagents previously used at the Site (described below) was applied, using 12 injection points.

Additional soil sampling at off-site locations was most recently conducted in 2012. Nineteen soil borings were completed at the following residential property addresses using a hand auger: 102, 106, 110, 114, 118, 126, 128, 130, 134 and 142 South Marquette Street. Access could not be obtained for one additional property (138 South Marquette Street). One soil sample from each boring was analyzed for VOCs and PCBs. The results of the soil sampling activities were presented in a letter report dated May 7, 2012. A copy of the letter report is included in Appendix B. The analytical results have not been received for 106 South Marquette Street (sampled May 16, 2012). The following is a summary of the results:

- None of the soil samples contained detectable concentrations of PCBs.
- Only one soil sample, collected from 102 South Marquette Street, contained detectable concentrations of VOCs. Soil Samples 102-2 contained PCE at 2.19 mg/kg, TCE at 0.445 mg/kg, and cis-1,2-dichloroethene at 0.49 mg/kg.

Based on WDNR correspondence, a request has been made to the laboratory to modify the reported results with lowered detection limits. A revised report will be provided to WDNR.

2.3.9 Groundwater Monitoring Program

As outlined in the previous sections, periodic groundwater monitoring has been ongoing since 1995. There were 21 monitoring wells and piezometers installed through April 2012. The well locations are depicted on Figure 2-3. Table 2-1 presents a summary of well construction details. The screen depths of the wells vary, with the shallowest well (MW-12S) screened to 13 feet and the deepest well (MW-5D2) screened to 170.8 feet. For the purpose of evaluating the lateral and vertical extent of groundwater in this document, wells were divided into three groups: 1) wells with screens located at a depth of 50 feet or less (MW-1, MW-2S, MW-2D, MW-3S, MW-4S, MW-5S, MW-6S, MW-7, MW-8, MW-9, MW-10S, MW-11S and MW-12S), 2) wells with screens located at a depth between 50 and 75 feet (MW-3D, MW-4D, MW-6D and MW-9D), and 3) wells with screens located at depths greater than 75 feet (MW-3D2, MW-4D2, MW-5D and MW-5D2).

The results of the groundwater monitoring activities were generally reported on an annual basis, and a consistent monitoring schedule was established in 2006. A copy of the annual report for 2010, dated January 18, 2011, is included in Appendix B, and provides an overview of trends in groundwater quality. A round of groundwater samples from all the wells was collected in April 2012, and the results are summarized in Table 2-2 and depicted on Figures 2-4, 2-5 and 2-6. The following is an overview of groundwater conditions:

- Groundwater flow measured by the group of monitoring wells and piezometers screened at a depth of 50 feet or less (MW-1, MW-2S, MW-2D, MW-3S, MW-4S, MW-5S, MW-6S, MW-7, MW-8, MW-9, MW-10S, MW-11S and MW-12S) has been interpreted by others as being southwest to south-southwest. Groundwater is located within the unconsolidated soil in the northern portion of the Site and in the upper portion of the sandstone bedrock in the southern portion of the Site. Some variability in flow, particularly due to a periodic groundwater high at Monitoring Well MW-5S, has occurred.

- Groundwater flow measured by the group of piezometers screened from 50 to 75 feet (MW-3D, MW-4D, MW-6D and MW-9D) has been interpreted by others

as varying from southeast to south-southwest. Each of the piezometers is screened in the sandstone bedrock.

- Groundwater flow measured by the group of piezometers screened deeper than 75 feet (MW-3D2, MW-4D2, MW-5D, and MW-5D2) has been interpreted by others as varying from east to south-southwest. It is noted that the piezometers are located along nearly a straight line, which may contribute to the measured variability in flow direction. The horizontal gradient is also very flat (0.0006 foot/foot in July 2010), so slight variations in measurements may influence the depicted flow direction.

- Historically, the primary constituents of interest in groundwater have been chlorinated VOCs. These include PCE and the associated daughter products formed during biodegradation (TCE, dichloroethene isomers, and vinyl chloride). Petroleum constituents have been detected in Monitoring Wells MW-6S and MW-6D, located at the southeastern portion of the Site. This area was a former gasoline service station, and another service station with a known release is located further west, across Atwood Avenue.

- The extent of contamination in the 0 to 50 feet groundwater interval is defined to the west (MW-2S and MW-10S), east (MW-7, MW-8 and MW-11S), south (MW-4S and MW-6S), and north (MW-12S). The highest VOC concentrations in the shallow groundwater are located in the northern portion of the Site, at MW-3S, with the April 2012 sample containing PCE at 1,600 µg/L. In general, concentration trends in this groundwater interval have been stable to decreasing since 1995.

- The extent of chlorinated VOC contamination in the 50 to 75 foot groundwater interval is defined to the southwest (MW-4D). The sampling results are depicted on Figure 2-5. The remaining wells screened in this interval contained PCE at concentrations above the NR 140 ES, although the PCE concentrations at MW-6D and MW-9D are relatively low. Chlorinated VOC concentrations in this interval have been stable.

  Piezometer MW-6D contained benzene at 3,900 µg/L in April 2010, which is indicative of a separate release. Other petroleum VOCs indicative of a gasoline release were also present. The sampling results are depicted on Figure 2-5. The extent of these contaminants is defined to the west by MW-4D, but not defined to the north, south or east.

- The extent of VOCs in the 75 foot to 171 foot groundwater interval is defined to the south (MW-4D2), but not defined to the north, east or west. The highest detected concentration of VOCs was at Monitoring Well MW-3D2 in April 2012, with PCE detected at 2,600 µg/L. The VOC results for these wells indicate the vertical extent of impacts is not defined.

It should be noted that the April 2010 and April 2012 groundwater results were used to make a general determination of the lateral extent of impacts. Variations in well screen locations, the presence of the water table in both the consolidated and unconsolidated formations, and the potential for fracture flow within the bedrock may all contribute to variations in lateral extent.

The WDNR has requested the installation of a deeper piezometer at the Monitoring Well MW-3 well nest to further evaluate the vertical extent of groundwater. This work is being addressed through *Bedrock Characterization Work Plan*, submitted to the WDNR on May 22, 2012.

2.3.10 Vapor Monitoring Program

As describe above, vapor monitoring was initiated in 2004. Four vapor probes (VP-1S, VP-2S, VP-1N and VP-2N) were installed along the east property boundary. The vapor sample from each vapor probe contained detectable concentrations of VOCs. PCE concentrations were reported up to 48 ppmv. These probes were periodically sampled using a variety of collection methods to evaluate changes in vapor concentrations.

The vapor probes on the Site were located in close proximity to the residential properties located adjacent to the Site (237, 249, and 261 Waubesa Street and 102, 114, 126, 202, 210, and 222 South Marquette Street). Soil vapor sampling was conducted at these properties in 2011. PCE concentrations were reported up to 4.6 ppmv. Several additional phases of vapor monitoring at the residential properties have been conducted as presented above.

In April 2012, four soil borings were advanced to approximately 8 feet below ground surface along the bike path located north of the Site. Soil vapor probes were installed in each soil boring with 6-inch steel screens approximately 7.5 feet below ground surface. Soil vapor samples were collected from the probes over an approximate 30-minute time period using 6-liter summa canisters. The vapor samples were submitted

for analysis of five VOCs by EPA Method TO-15: PCE, TCE, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride. The results of the vapor samples indicated that none of the samples contained vapor concentrations above the non-residential sub-slab screening levels.

A soil vapor extraction (SVE) system (discussed below) was installed along the northeastern property boundary to prevent offsite migration of vapors. The system is discussed in more detail in subsequent sections.

2.4 Overview of Previous Remedial Measures

Several phases of remediation have been conducted at the Site. The following sections present a brief overview of previous and ongoing remedial measures. Figure 2-7 depicts the locations of the remediation areas.

2.4.1 Soil Remediation

Several soil remedial action options were evaluated during the early phases of the site investigation. The March 18, 1997 letter report initially proposed excavation of impacted soil, which was reiterated in the 1998 letter report. Following the completion of additional investigation activities and further evaluation of alternatives, soil excavation was deemed to be unworkable due to the close proximity of soil to the building and the presence of utilities. Dames & Moore proposed the use of bioremediation using BiOx reagent in a letter dated April 6, 1998.

1998/1999 Soil Remediation: The results of the remediation activities were presented in a letter report dated March 21, 2000. A copy of the letter report is included in Appendix C. The BiOx reagent was initially applied in June and July 1998. Injections were completed in two areas: the northern portion of the former drainage ditch, and the area near the north former vapor degreaser vent. Two additional applications were made in the former drainage ditch area in December 1998 and May 1999.

Verification soil sampling was conducted during the remediation activities. Concentrations of PCE were reduced to below the site-specific residual contaminant level (RCL) of 1 mg/kg established for the remedy.

2005 Soil Remediation: A monitoring well nest (MW-5S/MW-5D) was installed in a loading dock area along the east side of the building in 2001. Groundwater samples collected from the well nest contained elevated levels of PCE. Further review of the

facility's historical operations determined that a second vapor degreaser had been located in this area of the building, and vented from an exterior wall near the loading dock. Several phases of soil sampling were completed in 2002, 2004 and 2005. Based on the results of the 1998/1999 soil remediation, a comparable remedy was conducted in 2005 to address impacts from the second former vapor degreaser unit.

Cool-Ox was selected as the reagent for this phase of remediation. The results of the remedy were presented in a letter report dated March 23, 2006. A copy of the letter report is included in Appendix C. In summary, 119 borings were advanced in the treatment area located along the loading dock to apply the reagent, which stimulated the biodegradation of the chlorinated VOCs. Comparison of pre-and post-treatment soil samples indicate that PCE concentrations decreased from the 487 to 782 mg/kg range to the 0.2 to 3.2 mg/kg range.

2.4.2 Groundwater Remediation

Several groundwater remedial action options were also evaluated during the early phases of the site investigation. The 1997 letter report initially proposed continued monitoring, with the potential installation of an ozone sparge system. A pilot test for ozone sparging was completed in 2007, and the results were provided in a letter dated June 6, 2007. A copy of the letter is included in Appendix C.

The pilot test was conducted near Monitoring Wells MW-3S/MW-3D/MW-3D2. A sparge point was installed, and ozone sparging was conducted for 2 weeks. Reductions in PCE concentrations were observed at Monitoring Wells MW-3S and MW-3D. An ozone sparge system, consisting of three ozone sparge wells, was installed in the eastern portion of the Site, north of the Monitoring Wells MW-5S/MW-5D/MW-5D2 well nest. An overview of the system installation and system component locations was provided in a letter report dated February 11, 2009. A copy of the letter report is included in Appendix C. The system operated from 2008 to 2012.

2.4.3 Vapor Mitigation

A pilot test was conducted in February 2012 to evaluate SVE for controlling the off-site migration of vapors at the Site. The results of the pilot test were submitted to the WDNR in the *Soil Vapor Extraction Pilot Test Summary and Phase 1 System Design* report. Implementation of a SVE system to address vapor migration in the northeast portion of the site was initiated following completion of the pilot test. The Phase 1 system details were documented in the *Phase 1 Soil Vapor Extraction System*

Construction Summary report. The SVE system started continuous operation on March 9, 2012.

Construction of the SVE system included utility clearance; drilling and installation of eight SVE wells; installation of individual conveyance piping to connect each well to the SVE system; and placement of a mobile SVE system consisting of an extraction blower, knock-out tank, influent piping manifold and associated piping and instrumentation; installation of a vapor-phase granulated activated carbon vessel for treatment of the system discharge; and installation of an above-grade discharge stack to vent the treated soil vapor to the atmosphere approximately 25.1 feet above grade. The system is connected to the eight new SVE wells and SVE-1 that was previously installed. Operation, maintenance, and monitoring of the system is ongoing. The data collected to date indicate the Phase I SVE system is operating as intended and off-site vapor migration is being controlled.

During installation of the SVE system, soil was excavated to install wells and conveyance piping. Excess soil that could not be placed back in the conveyance piping trenches was stockpiled, and waste characterization samples were collected. The samples contained detectable concentrations of PCBs.

2.5 Investigation Scoping

Based on a review of the historical investigation and remediation activities, data gaps were identified. Additional work is needed to complete the site investigation:

- Twenty-one monitoring wells have been installed through 2012. Additional deep monitoring wells are needed to refine delineation in groundwater.

- In general, soil and groundwater samples have been analyzed for only VOCs due to the identified releases of PCE. Laboratory analysis of a soil sample for waste characterization detected PCBs, suggesting other constituents may be present.

Additional investigation is also needed to evaluate soil for the presence of PCBs and to characterize bedrock. Work plans for these activities were submitted under separate covers, and scoping associated with those activities was included in the work plans. The work plan for the PCB investigation included analytical testing of soil samples for PCBs and other constituents, including VOCs, PAHs, Resource Conservation and Recovery Act (RCRA) metals, and total cyanide.

The scope of the investigation activities presented herein was developed by reviewing the historical record to obtain information to complete the evaluation of relevant items enumerated under NR 716.07 (1) through (11). These items include historical operations, discharges, potential receptors, and impacted media. The following sections present an overview of the information used to scope the investigation.

History of Operations: Historical facility operations have been researched throughout the investigation in order to determine the sources of constituents. In addition, Phase I ESAs have been completed.

As discussed in the previous section, the Site has been used for industrial activities for more than 100 years. Madison-Kipp Corporation purchased the northern portion of the property in 1898, and the southern portion of the Site in 1917. Development initially consisted of a building at the north end of the Site and a building along Atwood Avenue to the south. Building additions were constructed in several phases, and by 1955 the initial two buildings were connected by these additions. The current configuration of the building was established by 1968.

The Site is a metals casting facility. Natural gas-fired furnaces are used for melting metals, which are then poured into molds to cast parts. The facility conducts limited post-casting processing of parts. Current chemical usage at the facility includes chlorine, hydraulic oils, caustic solutions and stoddard solvent. Waste streams consisted primarily of solid wastes such as aluminum byproduct, used steel shot, wastewater sludge, and general refuse.

Based on the Phase I ESA and other reviews, the following operations were identified at the Site that have been or could be potential sources of constituents:

- A PCE AST had been located along the northeast exterior of the building. A drainage ditch near this area extended northward. Elevated concentrations of PCE were detected in soil samples collected from along the ditch, with the highest concentrations located at the northernmost tip of the building.

- Two vapor degreasing vents discharged condensate to the exterior of the building. One vent was located along an east exterior wall of the northern portion of the building. A second vent was located along an east exterior wall of the central portion of the building, near the east property boundary. Elevated concentrations of PCE were detected in soil samples from both areas, with the higher concentrations located near the east property boundary.

- Oil was reportedly spread in the north parking lot to control dust in the years prior to paving the area. Because this was oil from facility operations, and because PCB-containing oils were utilized at the facility in the past, it is considered possible that PCBs are present beneath the pavement. Soil samples collected from excavated soil during installation of a vapor extraction system in 2012 contained PCBs. Soil samples collected from the east adjacent properties in 2012 did not contain PCBs.

- The 1942 and 1950 Sanborn maps included with the 2010 Phase I ESA of the Site identified a gasoline service station formerly located on what is currently the southeast parking lot of the Site (northwest corner of Atwood Avenue and Marquette Street). Two monitoring wells (MW-6S and MW-6D) located in the southeast portion of this parking lot contain petroleum VOCs consistent with a gasoline release.

- The Phase I ESA also identified a former Clark service station, located at 2801 Atwood Avenue as an active remediation site, and was located directly south of the Site across Atwood Avenue. As noted above, monitoring wells located in the southeastern corner of the Site contain petroleum VOCs.

- A BP gasoline service station is currently operating at the southeastern corner of Atwood Avenue and Waubesa Street, across from the Site.

The locations of these areas are depicted on Figure 2-2 and on the historical figures in Appendix B. This information was used to select boring locations for additional investigation.

Types of Constituents: The Phase I ESA identified current chemical usage, which includes chlorine, hydraulic oils, caustic solutions and stoddard solvent. Historical chemical usage included PCE and oil potentially containing PCBs. A former gasoline service station was located in the southeastern portion of the Site; chemical usage at this location likely included petroleum products such as gasoline, diesel and motor oil.

Historical analytical data was also reviewed to identify constituents for inclusion during this phase of investigation. This data was discussed earlier in this document, and copies of historical investigation reports are included in Appendix B. Based on historical operations and site investigation data, constituents of potential interest include the following:

- Chlorinated solvents, including PCE.
- Petroleum hydrocarbons related to stoddard solvent, hydraulic oil, gasoline, diesel, and motor oil.
- PCBs.

History of Discharges: ARCADIS reviewed the WDNR Bureau of Remediation and Redevelopment Tracking System (BRRTS) to identify releases that have occurred at the Site. Six BRRTS numbers were listed for the Site's Facility Identification Number 113125320:

- BRRTS#04-13-047387: This incident occurred on July 17, 1992. A cooling tower leak occurred, and 500 gallons of material were reported spilled. The incident was reported to the WDNR and closed.
- BRRTS#04-13-050991: This incident occurred on July 14, 1995. A faulty trip valve malfunctioned, resulting in the release of 75 gallons of hydraulic oil. The spill was cleaned up with absorbent. The spill was reported to the WDNR and closed.
- BRRTS#04-13-260538: This incident occurred on September 8, 2000. Operator error caused a spill of aluminum while being transferred to a furnace, resulting in the spill of 50,000 pounds of aluminum. The incident was reported to the WDNR and closed.
- BRRTS#04-13-281251: This incident occurred on September 9, 2001. A furnace temperature controller failed, resulting in a release of paint, ink or dye fumes to the atmosphere. The incident was reported to the WDNR and closed.
- BRRTS#02-13-001569: This activity is associated with the ongoing investigation and remediation activities associated with the chlorinated VOCs. Based on investigations conducted to date, the source of impacts are two former vapor degreasers as well as the former PCE storage area.
- BRRTS#02-13-558625: This activity was opened as the result of the PCBs detected in a soil characterization sample collected during installation of the SVE system.

Affected Media: Figures 2-2 and 2-3 depict the locations of all of the soil borings and monitoring wells that have been advanced at the Site to date. The results of the various phases of investigation were summarized earlier, and copies of the historical investigation reports are included in Appendix B. Based on the data, the following media have been affected:

- Soil: Investigation activities have identified VOCs in soil samples collected from the Site. Detected constituents have generally consisted of chlorinated VOCs. A waste characterization sample collected from excavated soil in 2012 contained PCBs.

- Groundwater: Investigation activities have identified VOCs in groundwater samples collected from the Site and from off-site locations.

- Vapor: Investigation activities have identified VOCs in subsurface vapor samples collected from the site and at off-site locations.

Proximity to other Sources: The Site is located in a mixed-use area of commercial, industrial and residential developments. The initial investigation at the Site was requested during investigation activities at two adjacent properties (Madison Brass Works and Kupfer Iron Works). The 2010 Phase I ESA included a regulatory database search of environmental activities at nearby properties. A copy of the Phase I ESA is included in Appendix B. The following is a summary of the regulatory database review from the Phase I ESA:

- RCRA Small Quantity Generators – Two identified within 0.25 mile of the Site.

- RCRA Conditionally Exempt Small Quantity Generators – One identified within 0.25 miles of the Site. Madison-Kipp Corporation was also identified.

- Solid Waste Disposal Sites – One identified within 0.5 mile of the Site.

- Leaking Underground Storage Tanks – Thirty were identified within 0.5 mile of the Site.

- Leaking ASTs – Four were identified within 0.5 mile of the Site.

- Registered Storage Tanks – Seven were identified within 0.25 mile of the Site.

- Institutional Control/Engineering Control – Twenty were identified within 0.5 mile of the Site.

- Wisconsin Emergency Response Program – Seven were identified within 0.5 mile of the Site.

The Phase I ESA identified one of the leaking underground storage tank sites (Former Clark station, BRRTS# 03-13-11339) as a REC. The former Clark station, located at 2801 Atwood Avenue is an active remediation site, and was located directly across Atwood Avenue from the Site. According to the BRRTS database, free product is present at the former Clark station, and the WDNR has requested a vapor intrusion study. The Kupfer Iron Works property, 149 Waubesa Street, was listed on two of the databases (Wisconsin Emergency Response Program database and Institutional Control/Engineering Control database). This site has received closure from WDNR. However, inclusion on the Institutional Control/Engineering Control database indicates that residual contamination remains in place. Based on the direction of groundwater flow, the Kupfer Iron Works site is located directly upgradient of the Site.

Access: Most of the investigation activities described in this work plan will take place on the Site. The areas where investigation activities will occur consists of parking lots, which are readily accessible.

Several piezometers are proposed at off-site locations. Access agreements will need to be obtained for these off-site locations, and piezometer locations may need to be shifted to accommodate the property owners and location of utilities.

Potential Receptors: ARCADIS identified potential receptors for the identified impacted media (soil, groundwater, and vapor) to be evaluated by this work plan.

For soil, the potential exposure pathways include ingestion (residential, commercial/industrial worker and construction worker), inhalation (residential, commercial/industrial worker and construction worker), and migration to groundwater. For groundwater, the potential receptor is ingestion (commercial/industrial worker). For vapor, the potential exposure is inhalation (residential).

ARCADIS reviewed the WDNR's web-based database to identify nearby public water supply wells, which are depicted on Figure 2-8. One public water supply well operated by the Madison Water Utility (Unit Well 8) is located within 1 mile of the Site.

Sensitive Habitats: The Site is located in a mixed-use area of commercial, industrial and residential developments. No sensitive species, habitat, ecosystem, wetlands, or outstanding resource waters are located in the vicinity of the facility. It is noted that the Site is located at the northeast end of the Madison isthmus, approximately 1,500 feet north of Lake Monona and approximately 6,800 feet east of Lake Mendota.

There is a rain garden located adjacent to the northeast property line. While not a habitat for sensitive species, this area has been identified as part of the investigation scoping as rain gardens are typically designed to retain storm water and facilitate infiltration.

Background Soil and Water Quality and Climatological Conditions: Background soil and groundwater quality issues that may affect investigation or remediation have not been identified to date at the Site.

Climatological conditions at the facility should not adversely affect the scope of the supplemental investigation.

Paragraphs (9) and (10) of NR 716.07 address interim and remedial actions. Interim actions have been taken in this area, and were discussed earlier in this document.

3. Overview of Investigation Strategy

This work plan presents the means and methods for conducting investigation activities at the Site. The results of the investigation will be used in conjunction with the previous investigation data and data to be collected from two other investigations planned for the Site to evaluate the extent of impacts and to develop a remediation strategy. The work plan proposes the following investigation activities:

- Thirty-seven borings will be advanced to a depth of 35 feet or to the top of bedrock, to further delineate VOC concentrations in groundwater. These borings are being advanced as part of an investigation to evaluate PCBs in soil, and will be used as part of this investigation to evaluate VOCs in groundwater.

- Installation of six additional piezometers to further evaluate the vertical and lateral extent of chlorinated VOC groundwater impacts. Two nests of two piezometers will be installed. One nest will be installed off-site to the southeast and the second nest off-site to the east. One off-site piezometer will be installed west of the Site. A deep piezometer will be installed at the existing Monitoring Well MW-6 well nest.

- A round of groundwater samples will be collected from the new and existing wells for analysis of VOCs, PAHs, PCBs, dissolved RCRA metals, and total cyanide.

- A round of soil vapor samples will be collected from the existing network of soil vapor probes on the Site.

- The results will be presented in a site investigation report.

The work outlined above will be conducted in conjunction with investigation activities proposed in the *Work Plan for Polychlorinated Biphenyl Investigation* and the *Bedrock Characterization Work Plan*. The *Work Plan for Polychlorinated Biphenyl Investigation* presented a scope of work for evaluating PCBs and other constituents in soil as requested by the WDNR. The *Bedrock Characterization Work Plan* presented a scope of work for evaluating the vertical extent of groundwater and characterizing the bedrock. As part of this work plan a deep piezometer is proposed at the Monitoring Wells MW-3 and MW-5 well nests. The results from the three investigations will be presented in a single site investigation report.

4. Investigation Work Plan

The following sections present a description of the work to be completed during the investigation. The contents of this section were prepared in accordance with NR 716.09, Wis. admin. code.

4.1 Health and Safety

Prior to beginning the investigation, the Site health and safety plan (HSP) will be updated to address the planned field activities. Utility marking arrangements will be made through Digger's Hotline (the State of Wisconsin Public Utility clearance service), a ground penetrating radar survey, a private utility locator, and discussions with property owners. Prior to beginning work each day, a "tailgate" health and safety briefing will be held to discuss the activities and identify ways to ensure the health and safety of Site workers. If conditions are encountered during Site investigation activities that differ from those outlined in the HSP, the Site activities will be revaluated to determine the appropriate actions that will ensure the health and well-being of the workers.

4.2 Boring and Piezometer Locations

The locations of the direct-push boring groundwater sampling locations and piezometers described in this work plan were selected based on the information identified during the investigation scoping. In summary, 37 direct-push boring groundwater samples and six piezometers are proposed for the investigation.

The direct-push boring groundwater sample locations were selected to evaluate groundwater conditions at the bedrock surface. The direct-push boring groundwater sample locations in the northeastern parking lot and southwestern parking lot were selected to evaluate VOCs associated with the PCE releases. The direct-push boring groundwater sample locations in the southeastern parking lot were selected to evaluate VOCs associated with the PCE releases and the petroleum-related VOCs detected at the MW-6 well nest. The boring locations are depicted on Figure 4-1. In an effort to combine field activities and complete the investigation as quickly as possible, these borings will be advanced during a separate investigation that has been proposed to evaluate PCBs in soil.

In addition to the 37 direct-push groundwater sample locations, Figure 4-1 depicts the locations of the additional soil borings that will be advanced during the PCB

investigation. Soil samples from these borings will be analyzed for PCBs, VOCs, PAHs, RCRA metals, and total cyanide. The results for the soil analysis will be reviewed in conjunction with the groundwater data collected during this investigation and presented in the site investigation report.

Based on the historical groundwater monitoring analytical results, additional delineation of the vertical and horizontal extent of groundwater is necessary. Six additional piezometers will be installed to further evaluate the horizontal and vertical extents of groundwater impacts. The following is an overview of well locations.

- One nest of two piezometers will be installed off-site to the southeast, at the intersection of Oakridge Avenue and Atwood Avenue.
- One nest of two piezometers will be installed off-site to the east.
- One off-site piezometer will be installed west of the site.
- One on-site piezometer will be installed at the existing MW-6 well nest.

The proposed piezometer locations, with the exception of the well nest proposed to the southeast, are depicted on Figure 4-2. The southeast well nest is proposed to be located at the intersection of Oakridge Avenue and Atwood Avenue, but is not depicted due to the scale of the well location figure.

It should be noted that the proposed boring and piezometer locations depicted on Figures 4-1and 4-2 are approximate. Changes to these locations may occur based on results from the bedrock characterization study, screening results from nearby borings, impediments such as underground utilities and above-grade infrastructure, and access agreements with property owners.

4.3 Direct-Push Soil Boring Sampling and Analysis Plan

A direct-push drill rig will be used to advance soil borings for collecting soil and groundwater samples. Thirty-seven soil borings will be advanced to a depth of 35 feet or to the top of bedrock. Because groundwater samples will be collected from the deeper borings, those borings will be terminated below the water table, at the top of the bedrock. Based on previous investigations conducted at the Site, each boring will be advanced to a depth of approximately 35 feet. The locations of these borings are depicted on Figure 4-1. In an effort to combine field activities and complete the

investigation sooner, these borings will be advanced during a separate investigation that has been proposed to evaluate PCBs in soil. Below is a summary of the proposed drilling, soil sampling, and groundwater sampling activities.

4.3.1 Drilling

The direct-push soil borings will be advanced using a sampling vehicle equipped with a Geoprobe Series AT-660 Large Bore Soil Sampler (or comparable equipment). Soil logging and sample collection was described in the PCB work plan dated May 21, 2012.

4.3.2 Groundwater Sampling

After the soil sampling described in the PCB work plan has been completed, groundwater samples will be collected. The groundwater sample locations are depicted on Figure 4-1.

Groundwater samples will be collected from a stainless steel sampling screen advanced in each borehole. The drill string will be advanced to the top of bedrock, and the outer casing will be retracted to expose the screen to allow collection of a groundwater sample. A dedicated piece of polyethylene tubing will be lowered into each screen through the drill string to purge and sample the groundwater. The water will be purged to remove fines using a peristaltic pump. Following purging, groundwater samples will be collected and submitted for laboratory analysis of VOCs. The groundwater samples will be collected and preserved in the field by purging water directly into three 40-millilter glass vials, each containing two milliliters of hydrochloric acid preservative. The samples will be analyzed for VOCs.

Following the groundwater sampling, the sampling rods and screen will be removed and the boreholes will be abandoned by filling the borehole with granular bentonite, and capping the surface with like material (asphalt or concrete patch).

4.3.3 Analytical Parameters

The preceding section listed the analytical parameters for the sampling activities. The following is a summary of the analytical methods:

- VOCs – U.S. EPA SW-846 Method 8260B

4.4 Piezometer Installation Sampling and Analysis Plan

Six additional piezometers will be installed to further evaluate the horizontal and vertical extents of groundwater impacts. The proposed piezometer locations are depicted on Figure 4-2. The locations, depths, and down-hole sampling plan for the piezometers may be revised based on the findings from the bedrock characterization proposed at the Monitoring Wells MW-3 and MW-5 well nests. Deviations from this work plan will be summarized in an addendum and submitted to the WDNR, if needed. Below is a summary of the proposed drilling, well installation, and groundwater sampling activities.

4.4.1 Soil and Rock Core Drilling

Each borehole will be advanced using hollow stem auger drilling in the unconsolidated soils and mud rotary drilling in the bedrock. Below is a summary of the soil and rock sampling methodology.

Hollow-stem auger drilling will be completed to advance through the unconsolidated soil to the top of bedrock by blind drilling. Once bedrock is encountered, an 8-inch temporary casing will be set approximately 2 feet into competent bedrock.

Bedrock drilling will be completed using mud rotary drilling methods. Mud rotary drilling methods were previously used to install wells at the Site. Mud rotary drilling is accomplished by a hydraulically powered top head drive with a bit attached to the bottom of the pipe that rotates a drill pipe. Rock is broken up by the rotating bit as it is lowered into the formation. Mud and drilling fluid is pumped through the rotating drill pipe through holes in the drill bit. The drilling fluid then swirls at the bottom of the hole, picking up the rock chips that have been broken by the drill bit and transports them to ground surface through the space between the drill pipe and borehole. The rock chips are deposited at the surface and the drilling fluids are recirculated back down to the bottom of the borehole through the drill bit.

Temporary casing will be installed, as needed, to reduce the potential for the drag-down of contaminants as the boreholes are advanced through bedrock. The temporary casing seals the formation, thus minimizing/preventing vertical migration. Additionally, as the borehole is advanced deeper, drilling fluid is not recirculated through the contaminated groundwater.

Soil boring logs (WDNR Form 4400-122) will be prepared for each boring in accordance with WDNR requirements and will present both the classification and geologic properties of the materials encountered.

4.4.2 Down-hole Geophysical Survey

Based on the findings from the bedrock wells proposed at the Monitoring Well MW-3 and MW-5 well nests, down-hole geophysical logging may be conducted at the drilling locations proposed in this work plan. The purpose of the geophysical survey is to determine the locations of hydraulically significance, like fractures, and provide data to help correlate fractures and strata at the test borehole with existing wells where impacted groundwater is present. Multiple geophysical logging tools may be utilized including gamma, fluid temperature, fluid resistivity, caliber, heat plus flowmeter, high resolution acoustic borehole televiewer, and optical borehole televiewer.

Below is a summary of each tool's purpose.

- Gamma - All rock and soils emit gamma radiation in varying amounts. Gamma logging records the amount of natural gamma radiation emitted from the rock and provides a useful means of correlating stratigraphy between drilling locations.

- Fluid Temperature - Fluid temperature tool records water temperature. Since water flowing into or out of the well at a water-bearing zone, like a fracture, can create perturbations in the temperature profile in a well, a fluid temperature log can provide an indication of water-bearing zones.

- Fluid Resistivity - Fluid resistivity records electric conductivity of groundwater, and can identify and discriminate between different water-bearing zones if the total dissolved solids or ionic contact of the water in the two zones are different.

- Caliper - The caliper tool measures the borehole diameter. Perturbations in the caliper logs can indicate fractures, fractured zones, or areas of friable rock where drilling has enlarged the borehole beyond the nominal bit diameter.

- Heat Pulse Flowmeter - The heat pulse flowmeter will be conducted at static and dynamic conditions. The heat pulse flowmeter measures vertical flow rate of water in the borehole. Variations in the flow rate can help identify water-bearing fractures.

- Acoustic Televiewer - The acoustic televiewer provides an accurately scaled image of the borehole walls, allowing for identification of fractures, solution openings, and an estimation of fracture orientation and thickness using sonar pluses.

- Optical Televiewer - The optical televiewer provides a continuous, detailed and orientated 360º image of the borehole walls, allowing for identification of fractures to include calculating dip, strike, frequency and fracture aperture.

4.4.3 Packer Testing for Water Sampling

Groundwater samples will be collected from select drilling locations in the bedrock using a single or double packer to determine the vertical extent of groundwater impacts and aid in selecting the location for the well screen. A packer system consists of a stainless steel screen with a packer above (single packer) or above and below the screen (double packer). The packer system will be installed such that the packer seals the desired sample depth. After the drill casing is advanced to the desired sampling depth, the lead drill casing will be retracted and the packer system will be installed. The purpose of the packer system is to limit the flow of groundwater from above and below the desired sampling interval, so that a discrete interval of the borehole may be tested. Packer tests provide a means of assessing the hydraulic yield of the test zone, and of collecting groundwater samples for laboratory analysis. After pumping water from the sample interval to remove the effects of the drilling activities, a water sample will be collected from the interval.

The groundwater samples will be placed in laboratory-supplied containers. The containers will be placed in a cooler with ice for transport to the analytical laboratory. Groundwater sample will be submitted for analysis of VOCs by Method 8260B. These analyses will have expedited analytical turnaround time so the data can be used to determine where the piezometer will be screened.

4.4.4 Piezometer Installation and Development

After each borehole is drilled, a piezometer will be installed. The piezometers will be constructed in accordance with NR 141 Wis. adm. code. The groundwater analytical results from packer testing will be used to select the screen depth of each piezometer. A 5-foot, 0.010-inch, stainless steel screen and 2-inch Schedule 80 polyvinyl chloride will be used to construct each piezometer. However, a 10-foot stainless steel screen may be installed if multiple fractures are identified. A filter pack of coarse sand will rise

2 feet above the screen followed by two feet of fine sand topped with a minimum of a 5-foot bentonite seal. The remaining annular space will be filled with cement bentonite slurry. The wells will be completed at the surface with a flushmount well compartment set in concrete. Well construction forms (WDNR Form 4400-113A) will be completed for each of the new wells.

The goal of well development is to produce water free of sediment, drill cuttings and drilling fluids. The new wells will be developed in accordance with NR 141 Wis. adm. code. After a minimum waiting period of 12 hours after installation, the new wells will be developed using a surge and purge method or air lifting techniques. Well development forms (WDNR Form 4400-113B) will be completed for each of the new wells.

4.4.5 Hydraulic Conductivity Testing

In-situ hydraulic conductivity testing will be completed at the six new well locations using traditional slug testing or baildown testing techniques where the water table intersects the well screens and a pneumatic test method where the well screens are submerged. The purpose of hydraulic conductivity testing is to measure the ability of the rock to transmit water when subjected to a change in hydraulic gradient. The testing will also provide a means to evaluate whether existing wells are screened in low or high transmissivity portions of the aquifer (e.g., whether bedrock wells screen fractured or unfractured intervals of rock). These data help to interpret results from the wells both in terms of plume delineation and future remedial performance.

A pressure transducer will be set approximately 1 foot off the bottom of the wells where slug testing or baildown testing will be performed and approximately 20 feet below the water table where pneumatic testing will be performed. Slug testing involves inserting a solid polyvinyl chloride bar into the water column, the water level rises, and the recovery data is recorded. Once the slug is removed, the water column decreases, and this recovery data is recorded. Baildown testing involved rapid removal of water from the well, and recording recovery data. The pneumatic method involves ambient air being pumped into the sealed casing at the surface, displacing the casing water into the formation through the well screen. The well casing is subsequently depressurized, and the water level recovery data is recorded. The tests will be repeated up to three times on each well to confirm repeatability of the data.

4.4.6 Groundwater Sampling

Initially, a single round of groundwater samples will be collected from the new and existing monitoring wells. The water level in each well will be measured using a decontaminated electronic water level meter.

Following the collection of groundwater level measurements, groundwater samples will be collected from the new and existing wells (27 total) using low-flow sampling techniques. Low-flow sampling techniques are used to collect representative water samples in the formation adjacent to the well screen while 1) reducing water turbulence which may unnecessarily volatilize contaminants; 2) reduce turbidity levels that may bias analytical results high; and 3) reduce the volume of water requiring management.

Low-flow sampling consists of purging the groundwater at a low-flow rate (less than 150 milliliters per minute) until a set of field parameters (dissolved oxygen, temperature, pH, conductivity, oxidation-reduction potential, and turbidity) stabilize within 10 percent for three consecutive readings. Purging will be completed using a peristaltic pump or a stainless steel bladder pump with dedicated polyethylene tubing, depending on the depth to water. Field parameters will be measured using a calibrated multi-parameter meter. Once the field parameters stabilize, the water sample will be collected. Nitrile gloves will be worn by the sampling personnel and discarded between each sampling location and following any activity that may produce cross-contamination.

The groundwater samples will be collected and submitted for laboratory analysis of VOCs, PAHs, dissolved RCRA metals (field filtered), and PCBs. All containers and preservatives will be obtained directly from the analytical laboratories. Immediately after collection, the sample containers will be placed in a cooler with ice until shipment to the appropriate laboratory can be arranged. Standard chain-of-custody procedures will be followed throughout sample collection, storage, and shipment.

4.4.7 Soil Vapor Sampling

One round of soil vapor samples will be collected from thirteen Site vapor monitoring points and four vapor monitoring points located along the bike path north of the Site. The vapor samples will be collected over an approximate 30-minute time period using 6-liter summa canisters. The vapor samples will be submitted for analysis of five VOCs by EPA Method TO-15: PCE, TCE, cis-1,2-dichloroethene, trans-1,2-dichloroethene,

and vinyl chloride. For quality control purposes, ambient air samples will be collected at the same time each day vapor samples are collected.

4.4.8 Analytical Parameters

The preceding sections listed the analytical parameters for the sampling activities. The following is a summary of the analytical methods:

- VOCs – U.S. EPA SW-846 Method 8260B
- PAHs – U.S. EPA SW-846 Method 8270C
- PCBs – U.S. EPA SW-846 Methods 8082 and 680
- Dissolved RCRA Metals – U.S. EPA SW-846 Method 6010B/7471A
- Total Cyanide – U.S. EPA SW-846 Method 9014
- VOCs in soil gas samples – U.S. EPA Method TO-15

PCB analysis has typically been conducted using U.S. EPA Method 8082, which provides results based on Aroclor concentrations. In accordance with the May 30, 2012 *Conditional Approval* letter from the WDNR for the *Work Plan for Polychlorinated Biphenyl Investigation*, the PCB samples will be evaluated using homologue analysis for 10 percent of samples.

ARCADIS proposes to analyze the monitoring well/piezometer groundwater samples for PCBs using the method to quantify Aroclors (Method 8082). An additional 10 percent of the samples will be submitted for homologue analysis by Method 680.

4.5 Surveying

A Wisconsin-licensed surveyor will locate the horizontal location to Wisconsin state plane coordinates and vertical elevation for each boring and new piezometer location. Ground elevations will be surveyed to an accuracy of +/-1 foot.

4.6 Management of Investigative-Derived Wastes

Soil cuttings generated during the soil boring advancement will be containerized in appropriate roll-off containers. Water generated during soil boring advancement, sampling activities, and wash water generated during the cleaning of down-hole equipment will be containerized in polyethylene storage tanks. Arrangements will be made with a licensed disposal facility for the transportation and disposal of the wastes.

4.7 Investigation Reporting

Following receipt of the soil and groundwater analytical results, ARCADIS will prepare a report. The report will present the procedures followed during the investigation and the results of the field screening and analytical testing. Copies of all boring logs, well construction, well development, and borehole abandonment forms, analytical reports will be included in appendices. The report will also include the results of the PCB investigation and the bedrock characterization study being conducted under separate work plans.

5. References

Bradbury, Kenneth R., Swanson, S.K., Krohelski, J.T., and Fritz, A.K., 1999, Hydrogeology of Dane County, Wisconsin. Wisconsin Geological and Natural History Survey Open-File Report 1999-04.

Clayton, Lee and Attig, J.W., 1997. Pleistocene Geology of Dane County, Wisconsin. Wisconsin Geological and Natural History Bulletin 95.

Dames & Moore, 1995. Site Investigation, Madison-Kipp Facility, Madison, Wisconsin. April 20, 1995.

Dames & Moore, 1996. Progress Report, Site Investigation, Madison-Kipp Corporation Waubesa Street Facility, Madison, Wisconsin. March 20, 1996

Dames & Moore, 1997a. Results of Additional Soil and Groundwater Investigation, Madison-Kipp Corporation, Madison, Wisconsin. March 18, 1997.

Dames & Moore, 1997b. Results of Geoprobe Soil Sampling, Modification to Proposed Soil Remediation Strategy, and Establishment of Site-Specific Soil RCLs, Madison-Kipp Corporation, Madison, Wisconsin. May 30, 1997.

Dames & Moore, 1999. Groundwater Monitoring Update, Madison-Kipp Corporation. September 14, 1999.

Dames & Moore, 2000. Status Report – Soil Remediation Activities, Madison-Kipp Corporation Site, 201 Waubesa Street, Madison, Wisconsin. March 21, 2000.

RJN Environmental Services, LLC, 2010. Phase I ESA, Madison-Kipp Corporation – Waubesa Street. 2010.

RJN Environmental Services, LLC, 2011. 2010 Annual Groundwater Monitoring Report.

RJN Environmental Services, LLC, 2012. Madison-Kipp Corporation Soil Sampling and Analysis, Various Marquette Street Properties. May 7, 2012.

RSV Engineering, Inc., 2004. Proposal and Remedial Options Analysis, Soil & Groundwater Remediation, Madison-Kipp Corporation, Madison, Wisconsin. June 21, 2004.

RSV Engineering, Inc., 2005. Annual Soil and Groundwater Report, Madison-Kipp Corporation. March 25, 2005.

RSV Engineering, Inc., 2006a. Updated Phase I Environmental Site Assessment, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin. March 16, 2006.

RSV Engineering. Inc., 2006b. Annual Soil and Groundwater Report, Madison-Kipp Corporation. March 23, 2006.

RSV Engineering, Inc., 2007a. Annual Soil and Groundwater Report, Madison-Kipp Corporation. February 7, 2007.

RSV Engineering, Inc., 2007b. Ozone Pilot Test Results, Soil Vapor Update, Madison-Kipp Corporation. June 6, 2007.

RSV Engineering, Inc., 2009. Soil and Groundwater Report, Madison-Kipp Corporation. February 11, 2009.

Ruekert/Mielke, Inc., 2011. Wellhead Protection Plan, Unit Well 8, City of Madison, Wisconsin. Prepared for Madison Water Utility, March 2011.

URS, 2001. Groundwater Monitoring Results, Madison-Kipp Corporation, Madison, Wisconsin. December 27, 2001.

URS, 2002a. Phase I Environmental Site Assessment, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin. April 2002.

URS, 2002b. Groundwater Quality Update, Soil Sampling Results, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin. August 30, 2002.

URS, 2003. Project Status Report, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin. April 17, 2003.

ARCADIS

Table 2-1. Well Construction Details, Madison-Kipp Corporation, Madison, Wisconsin.

Well ID	Depth to Top of Screen (feet bls)	Depth to Bottom of Screen (feet bls)	Depth to Top of Bedrock (feet bls)	Total Depth Drilled (feet bls)
MW-1	14	24	NA	30
MW-2S	19	29	NA	29.5
MW-2D	39	44	34	44.5
MW-3S	19	29	NA	30
MW-3D	48	53	23	NA
MW-3D2	76	81	23	82
MW-4S	35	50	41	51
MW-4D	65	70	40	71
MW-4D2	91	96	40	NA
MW-5S	34	44	33	44
MW-5D	75	80	33	82
MW-5D2	165.8	170.8	NA	171.3
MW-6S	31.4	41.4	NA	41.4
MW-6D	65.5	70.5	33.25	70.5
MW-7	25	35	NA	35
MW-8	24	34	NA	34
MW-9	44	49	NA	49
MW-9D	64	69	37	69
MW-10S	11	21	NA	22
MW-11S	24	34	NA	36
MW-12S	3	13	NA	14

bls Below land surface.
NA Not applicable or available.

Table 2-2. Groundwater Analytical Results, April 2012, Madison-Kipp Corporation, Madison, Wisconsin.

Sample Name	Preventive		MW-1	MW-2D	MW-2S	MW-3D	MW-3D2	DUP-2	MW-3S
Sample Date	Action	Enforcement	04/11/12	04/11/12	04/11/12	04/12/12	04/12/12	04/12/12	04/12/12
Monitoring Well	Limit	Standard	MW-1	MW-2D	MW-2S	MW-3D	MW-3D2	MW-3D2	MW-3S
VOCs									
1,1-Dichloroethene	0.7	7	***0.94 J***	<0.29	<0.29	<0.29	<1.5	<1.5	<1.5
1,2,4-Trimethylbenzene	96	480	<0.22	<0.22	<0.22	<0.22	<1.1	<1.1	<1.1
1,3,5-Trimethylbenzene	96	480	<0.23	<0.23	<0.23	<0.23	<1.2	<1.2	<1.2
Benzene	0.5	5	<0.12	<0.12	<0.12	0.39 J	<0.6	<0.6	<0.6
Carbon tetrachloride	0.5	5	<0.28	<0.28	<0.28	<0.28	<1.4	<1.4	<1.4
Chloroform	0.6	6	<0.25	<0.25	<0.25	***0.93 J***	<1.3	<1.3	***3.7 J***
cis-1,2-Dichloroethene	7	70	***38***	<0.22	<0.22	***350***	***440***	***440***	***89***
Ethylbenzene	140	700	<0.14	<0.14	<0.14	<0.14	<0.7	<0.7	<0.7
Isopropylbenzene	NE	NE	<0.21	<0.21	<0.21	<0.21	<1.1	<1.1	<1.1
Methyl tert-butyl ether	12	60	<0.28	<0.28	<0.28	<0.28	<1.4	<1.4	<1.4
Methylene chloride	0.5	5	***8.5***	***8.1***	***8.6***	<0.63	<3.2	<3.2	<3.2
Naphthalene	10	100	<0.24	<0.24	<0.24	<0.24	<1.2	<1.2	<1.2
N-Propylbenzene	NE	NE	<0.19	<0.19	<0.19	<0.19	<0.95	<0.95	<0.95
p-Isopropyltoluene	NE	NE	<0.24	<0.24	<0.24	<0.24	<1.2	<1.2	<1.2
sec-Butylbenzene	NE	NE	<0.19	<0.19	<0.19	<0.19	<0.95	<0.95	<0.95
Tetrachloroethene	0.5	5	***23***	***610***	***1.2***	***1,100***	***2,600***	***2,600***	***1,600***
Toluene	160	800	<0.15	<0.15	<0.15	<0.15	<0.75	<0.75	<0.75
trans-1,2-Dichloroethene	20	100	0.77 J	<0.27	<0.27	5.9	6.4	5.8	5.4
Trichloroethene	0.5	5	***24***	***5.4***	<0.18	***160***	***190***	***190***	***120***
Vinyl chloride	0.02	0.2	***0.86***	<0.13	<0.13	<0.13	<0.65	<0.65	<0.65
Xylenes, Total	400	2,000	<0.3	<0.3	<0.3	<0.3	<1.5	<1.5	<1.5

All units are presented in micrograms per liter (µg/L).

Only analytes detected in groundwater samples are presented.

100 Exceeds the NR 140 Wisconsin Administrative Code Preventive Action Limit (PAL).

100 Exceeds the NR 140 Wisconsin Administrative Code Enforcement Standard (ES).

< Not detected.

DUP Duplicate sample.

µg/L Micrograms per liter.

NE Standard not established

J Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

VOCs Volatile Organic Compounds.

Table 2-2. Groundwater Analytical Results, April 2012, Madison-Kipp Corporation, Madison, Wisconsin.

Sample Name	Preventive		MW-4D	MW-4D2	MW-4S	MW-5D	MW-5D2	MW-5S	DUP-3	MW-6D	MW-6S
Sample Date	Action	Enforcement	04/10/12	04/10/12	04/10/12	04/12/12	04/12/12	04/12/12	04/12/12	04/12/12	04/11/12
Monitoring Well	Limit	Standard	MW-4D	MW-4D2	MW-4S	MW-5D	MW-5D2	MW-5S	MW-5S	MW-6D	MW-6S
VOCs											
1,1-Dichloroethene	0.7	7	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.58	<0.29
1,2,4-Trimethylbenzene	96	480	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	19	4.8
1,3,5-Trimethylbenzene	96	480	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.46	1.5
Benzene	0.5	5	<0.12	<0.12	<0.12	0.29 J	<0.12	<0.12	0.40 J	***1,500***	***4.1***
Carbon tetrachloride	0.5	5	<0.28	<0.28	<0.28	<0.28	<0.28	***1.2***	<0.28	<0.56	<0.28
Chloroform	0.6	6	<0.25	<0.25	<0.25	<0.25	<0.25	***0.84 J***	***0.88 J***	***3.6***	<0.25
cis-1,2-Dichloroethene	7	70	<0.22	<0.22	<0.22	***26***	<0.22	***13***	***14***	<0.44	<0.22
Ethylbenzene	140	700	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	8.7	9.8
Isopropylbenzene	NE	NE	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	23	4.1
Methyl tert-butyl ether	12	60	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.56	<0.28
Methylene chloride	0.5	5	<0.63	<0.63	<0.63	<0.63	<0.63	<0.63	<0.63	<1.3	***8.3***
Naphthalene	10	100	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	***110***	***19***
N-Propylbenzene	NE	NE	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	11	1.8
p-Isopropyltoluene	NE	NE	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	2.6	<0.24
sec-Butylbenzene	NE	NE	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	2.2	0.56 J
Tetrachloroethene	0.5	5	<0.22	***0.73 J***	***0.96 J***	***400***	***47***	***360***	***370***	***20***	<0.22
Toluene	160	800	<0.15	0.40 J	0.20 J	0.30 J	<0.15	<0.15	<0.15	36	2.5
trans-1,2-Dichloroethene	20	100	<0.27	<0.27	<0.27	1.3	<0.27	<0.27	<0.27	<0.54	<0.27
Trichloroethene	0.5	5	<0.18	<0.18	<0.18	***48***	<0.18	***9.8***	***10***	***3.9***	<0.18
Vinyl chloride	0.02	0.2	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.26	<0.13
Xylenes, Total	400	2,000	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	40	7.8

All units are presented in micrograms per liter (µg/L).

Only analytes detected in groundwater samples are presented.

100 Exceeds the NR 140 Wisconsin Administrative Code Preventive Action Limit (PAL).

100 Exceeds the NR 140 Wisconsin Administrative Code Enforcement Standard (ES).

< Not detected.

DUP Duplicate sample.

µg/L Micrograms per liter.

NE Standard not established

J Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

VOCs Volatile Organic Compounds.

Table 2-2. Groundwater Analytical Results, April 2012, Madison-Kipp Corporation, Madison, Wisconsin.

Sample Name	Preventive		MW-7	MW-8	MW-9D	DUP-1	MW-9D2	MW-10S	MW-11S
Sample Date	Action	Enforcement	04/10/12	04/10/12	04/11/12	04/11/12	04/11/12	04/10/12	04/12/12
Monitoring Well	Limit	Standard	MW-7	MW-8	MW-9D	MW-9D	MW-9D2	MW-10S	MW-11S
VOCs									
1,1-Dichloroethene	0.7	7	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29
1,2,4-Trimethylbenzene	96	480	<0.22	<0.22	<0.22	<0.22	<0.22	0.76 J	0.55 J
1,3,5-Trimethylbenzene	96	480	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23
Benzene	0.5	5	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Carbon tetrachloride	0.5	5	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28	<0.28
Chloroform	0.6	6	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
cis-1,2-Dichloroethene	7	70	<0.22	<0.22	<0.22	<0.22	***11***	<0.22	<0.22
Ethylbenzene	140	700	<0.14	<0.14	<0.14	<0.14	<0.14	0.20 J	<0.14
Isopropylbenzene	NE	NE	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21
Methyl tert-butyl ether	12	60	<0.28	<0.28	<0.28	<0.28	9.3	<0.28	<0.28
Methylene chloride	0.5	5	<0.63	<0.63	***9***	<0.63	***8.8***	<0.63	<0.63
Naphthalene	10	100	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
N-Propylbenzene	NE	NE	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
p-Isopropyltoluene	NE	NE	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
sec-Butylbenzene	NE	NE	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
Tetrachloroethene	0.5	5	<0.22	<0.22	<0.22	<0.22	***10***	<0.22	<0.22
Toluene	160	800	<0.15	<0.15	<0.15	<0.15	<0.15	0.54	0.73
trans-1,2-Dichloroethene	20	100	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
Trichloroethene	0.5	5	<0.18	<0.18	<0.18	<0.18	***3.8***	<0.18	<0.18
Vinyl chloride	0.02	0.2	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
Xylenes, Total	400	2,000	<0.3	<0.3	<0.3	<0.3	<0.3	0.83 J	0.86 J

All units are presented in micrograms per liter (µg/L).

Only analytes detected in groundwater samples are presented.

100	Exceeds the NR 140 Wisconsin Administrative Code Preventive Action Limit (PAL).
100	Exceeds the NR 140 Wisconsin Administrative Code Enforcement Standard (ES).
<	Not detected.
DUP	Duplicate sample.
µg/L	Micrograms per liter.
NE	Standard not established
J	Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
VOCs	Volatile Organic Compounds.

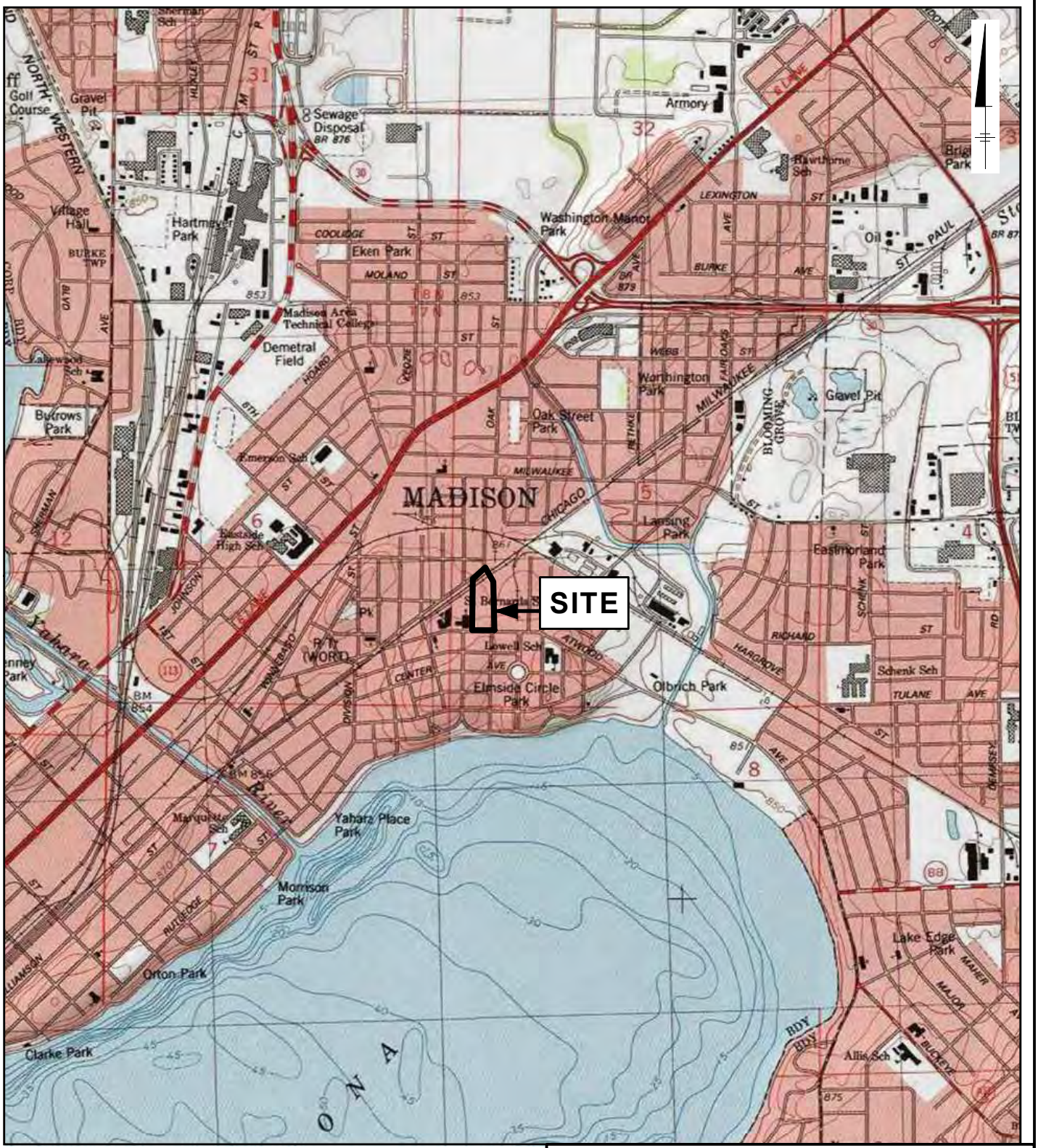
Table 2-2. Groundwater Analytical Results, April 2012, Madison-Kipp Corporation, Madison, Wisconsin.

Sample Name	Preventive		MW-12S	Trip Blank
Sample Date	Action	Enforcement	04/12/12	04/10/12
Monitoring Well	Limit	Standard	MW-12S	
VOCs				
1,1-Dichloroethene	0.7	7	<0.29	<0.29
1,2,4-Trimethylbenzene	96	480	1.2	<0.22
1,3,5-Trimethylbenzene	96	480	<0.23	<0.23
Benzene	0.5	5	<0.12	<0.12
Carbon tetrachloride	0.5	5	<0.28	<0.28
Chloroform	0.6	6	<0.25	<0.25
cis-1,2-Dichloroethene	7	70	<0.22	<0.22
Ethylbenzene	140	700	<0.14	<0.14
Isopropylbenzene	NE	NE	<0.21	<0.21
Methyl tert-butyl ether	12	60	<0.28	<0.28
Methylene chloride	0.5	5	<0.63	<0.63
Naphthalene	10	100	<0.24	<0.24
N-Propylbenzene	NE	NE	<0.19	<0.19
p-Isopropyltoluene	NE	NE	<0.24	<0.24
sec-Butylbenzene	NE	NE	<0.19	<0.19
Tetrachloroethene	0.5	5	***0.78 J***	<0.22
Toluene	160	800	0.64	<0.15
trans-1,2-Dichloroethene	20	100	<0.27	<0.27
Trichloroethene	0.5	5	<0.18	<0.18
Vinyl chloride	0.02	0.2	<0.13	<0.13
Xylenes, Total	400	2,000	1.6	<0.3

All units are presented in micrograms per liter (µg/L).

Only analytes detected in groundwater samples are presented.

100	Exceeds the NR 140 Wisconsin Administrative Code Preventive Action Limit (PAL).
100	Exceeds the NR 140 Wisconsin Administrative Code Enforcement Standard (ES).
<	Not detected.
DUP	Duplicate sample.
µg/L	Micrograms per liter.
NE	Standard not established
J	Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
VOCs	Volatile Organic Compounds.



SITE LOCATION

NOTE:
TOPO BASE MAP OBTAINED FROM ESRI ONLINE MAPPING, USING ARCMAP 10 ACCESSED 5/21/2012

0 2,000 4,000 Feet

GRAPHIC SCALE

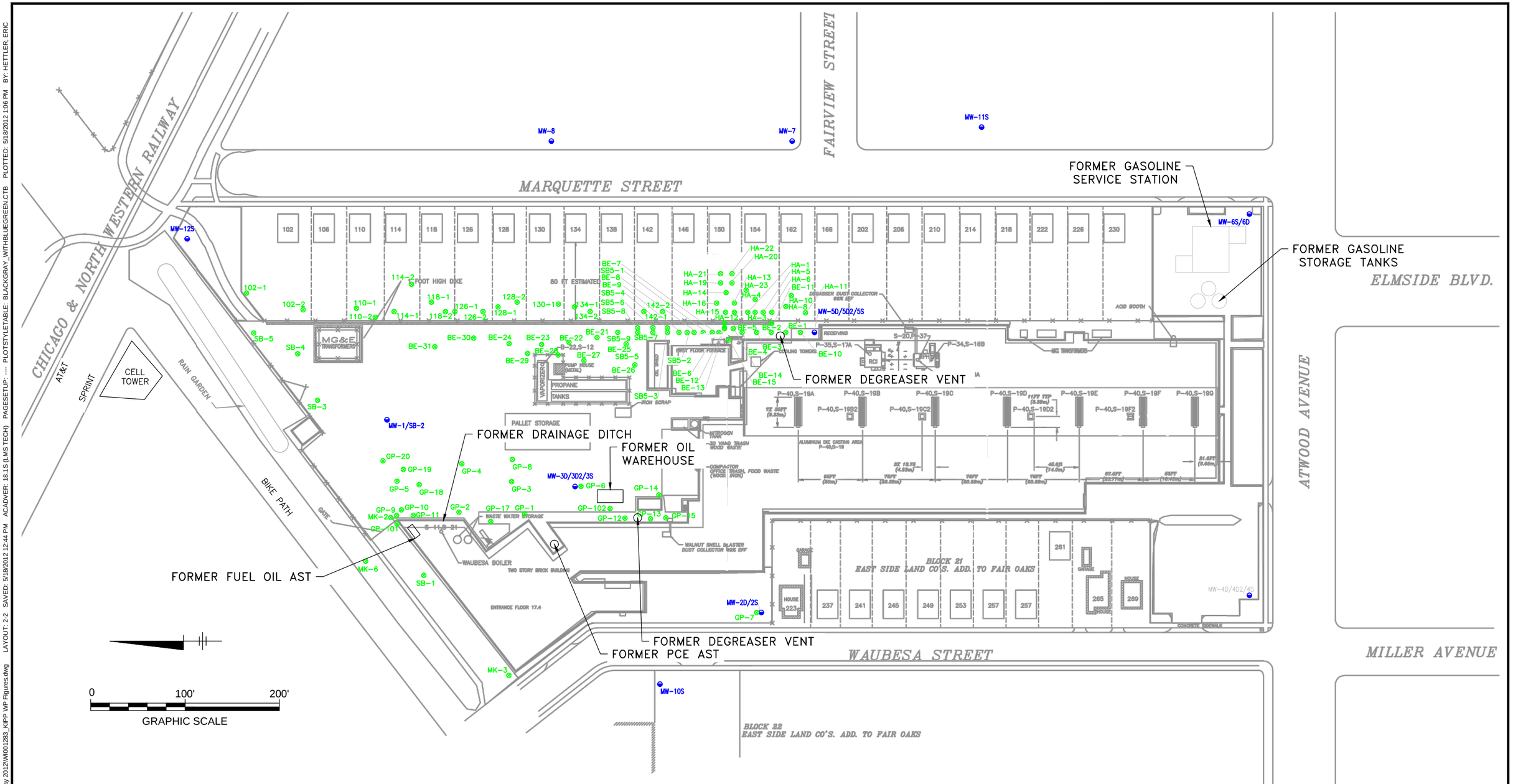
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

SITE LOCATION MAP

ARCADIS

FIGURE 2-1

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: E:\GIS\Madison_Kipp\Madison_Kipp\ArcMap\WorkPlanPCB\2-1 SiteLocation.mxd



LEGEND:

MW-2D/2S — MONITORING WELL

GP-7 — SOIL BORING

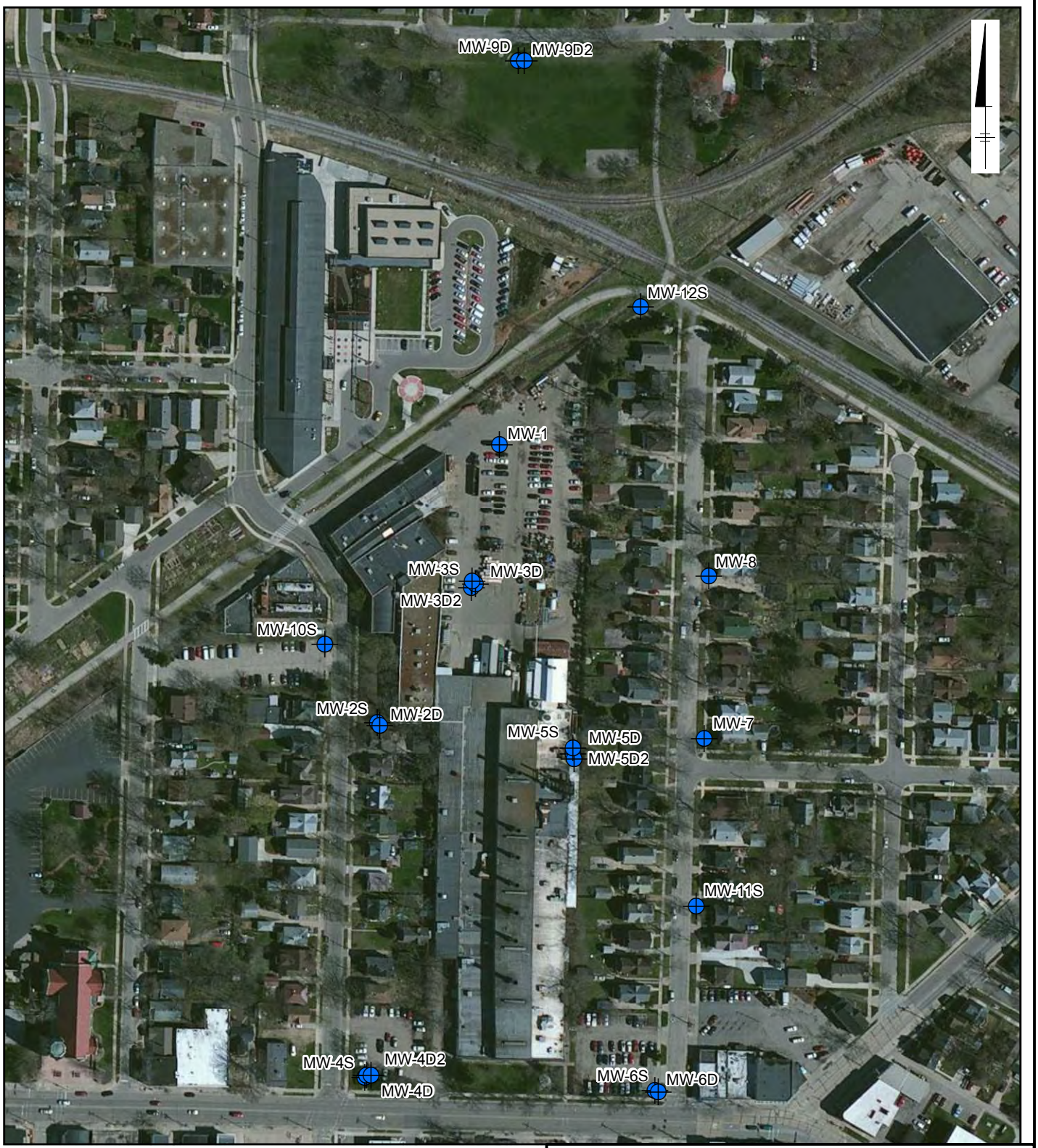
SOURCE: MADISON KIPP CORPORATION

MADISON KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

SITE LAYOUT, SOIL BORING AND MONITORING WELL LOCATIONS

ARCADIS

FIGURE 2-2



LEGEND:

MONITORING WELL

Notes:
1) AERIAL IMAGERY OBTAINED FROM BING IMAGERY SERVICE THROUGH ESRI ONLINE MAPPING, ACCESSED ON 5/18/2012

0 200 400 Feet

GRAPHIC SCALE

MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

MONITORING WELL LOCATIONS

ARCADIS

FIGURE 2-3

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: D:\GIS\Madison_Kipp\ArcMap\WorkPlanPCB\2-3_Well_Locations.mxd

LEGEND:

MONITORING WELL

180	Exceeds the Wisconsin Department of Natural Resources Preventive Action Limit
100	Exceeds the Wisconsin Department of Natural Resources Enforcement Standard
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Notes:
1) AERIAL IMAGERY OBTAINED FROM BING IMAGERY SERVICE THROUGH ESRI ONLINE MAPPING, ACCESSED ON 5/22/2012
2) µg/L = MICROGRAMS PER LITER
3) ND = NOT DETECTED

0 150 300 Feet
GRAPHIC SCALE

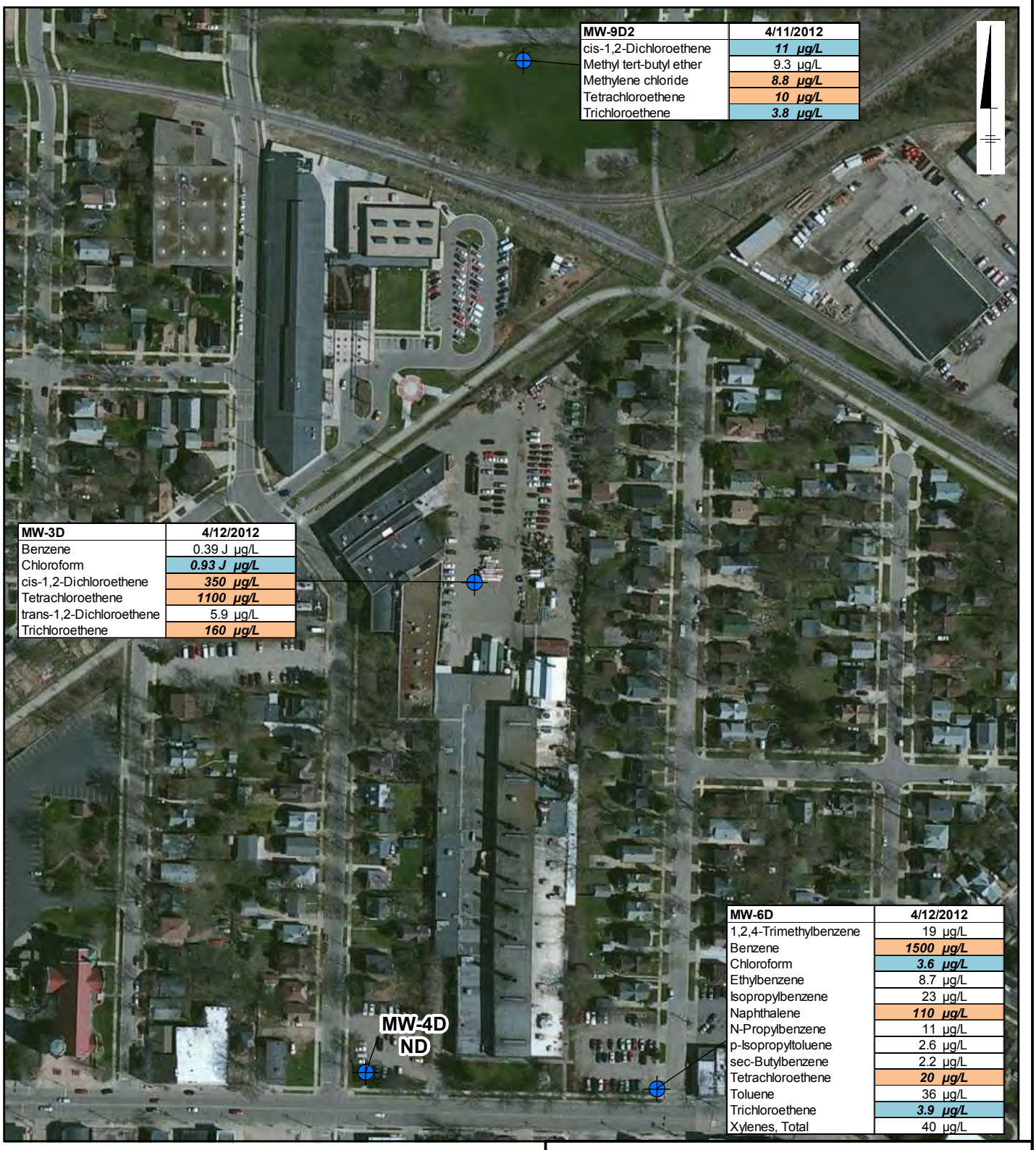
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

GROUNDWATER 0 - 50 feet
ANALYTICAL RESULTS - APRIL 2012

ARCADIS

FIGURE
2-4

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: D:\GIS\Madison_Kipp\ArcMap\WorkPlan\PCB\2-4_ShallowPiezometers.mxd



MW-9D2	4/11/2012
cis-1,2-Dichloroethene	***11 µg/L***
Methyl tert-butyl ether	9.3 µg/L
Methylene chloride	***8.8 µg/L***
Tetrachloroethene	***10 µg/L***
Trichloroethene	***3.8 µg/L***

MW-3D	4/12/2012
Benzene	0.39 J µg/L
Chloroform	***0.93 J µg/L***
cis-1,2-Dichloroethene	***350 µg/L***
Tetrachloroethene	***1100 µg/L***
trans-1,2-Dichloroethene	5.9 µg/L
Trichloroethene	***160 µg/L***

MW-6D	4/12/2012
1,2,4-Trimethylbenzene	19 µg/L
Benzene	***1500 µg/L***
Chloroform	***3.6 µg/L***
Ethylbenzene	8.7 µg/L
Isopropylbenzene	23 µg/L
Naphthalene	***110 µg/L***
N-Propylbenzene	11 µg/L
p-Isopropyltoluene	2.6 µg/L
sec-Butylbenzene	2.2 µg/L
Tetrachloroethene	***20 µg/L***
Toluene	36 µg/L
Trichloroethene	***3.9 µg/L***
Xylenes, Total	40 µg/L

LEGEND:

MONITORING WELL

100 Exceeds the Wisconsin Department of Natural Resources Preventive Action Limit
100 Exceeds the Wisconsin Department of Natural Resources Enforcement Standard
J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Notes:
1) AERIAL IMAGERY OBTAINED FROM BING IMAGERY SERVICE THROUGH ESRI ONLINE MAPPING, ACCESSED ON 5/22/2012
2) µg/L = MICROGRAMS PER LITER
3) ND = NOT DETECTED

0 200 400 Feet
GRAPHIC SCALE

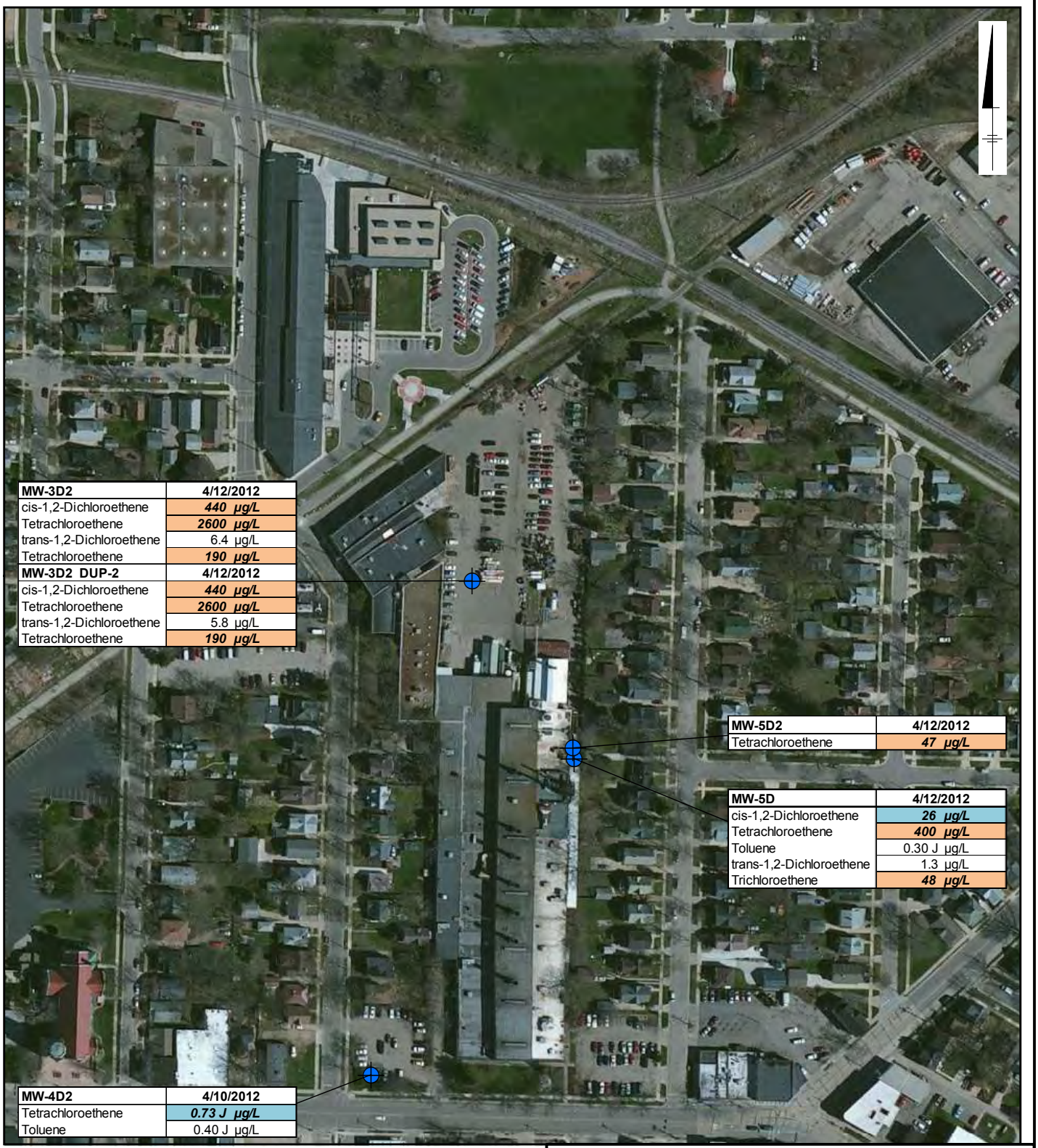
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

GROUNDWATER 50 - 75 FEET
ANALYTICAL RESULTS - APRIL 2012

ARCADIS

FIGURE 2-5

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: D:\GIS\Madison_Kipp\ArcMap\WorkPlanPCB\2-5_IntermediatePiezometers.mxd



MW-3D2	4/12/2012
cis-1,2-Dichloroethene	***440 µg/L***
Tetrachloroethene	***2600 µg/L***
trans-1,2-Dichloroethene	6.4 µg/L
Tetrachloroethene	***190 µg/L***
MW-3D2 DUP-2	**4/12/2012**
cis-1,2-Dichloroethene	***440 µg/L***
Tetrachloroethene	***2600 µg/L***
trans-1,2-Dichloroethene	5.8 µg/L
Tetrachloroethene	***190 µg/L***

MW-5D2	4/12/2012
Tetrachloroethene	***47 µg/L***

MW-5D	4/12/2012
cis-1,2-Dichloroethene	***26 µg/L***
Tetrachloroethene	***400 µg/L***
Toluene	0.30 J µg/L
trans-1,2-Dichloroethene	1.3 µg/L
Trichloroethene	***48 µg/L***

MW-4D2	4/10/2012
Tetrachloroethene	***0.73 J µg/L***
Toluene	0.40 J µg/L

LEGEND:

MONITORING WELL

100 Exceeds the Wisconsin Department of Natural Resources Preventive Action Limit
100 Exceeds the Wisconsin Department of Natural Resources Enforcement Standard
J Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Notes:
1) AERIAL IMAGERY OBTAINED FROM BING IMAGERY SERVICE THROUGH ESRI ONLINE MAPPING, ACCESSED ON 5/22/2012
2) µg/L = MICROGRAMS PER LITER
3) ND = NOT DETECTED

0 200 400 Feet
GRAPHIC SCALE

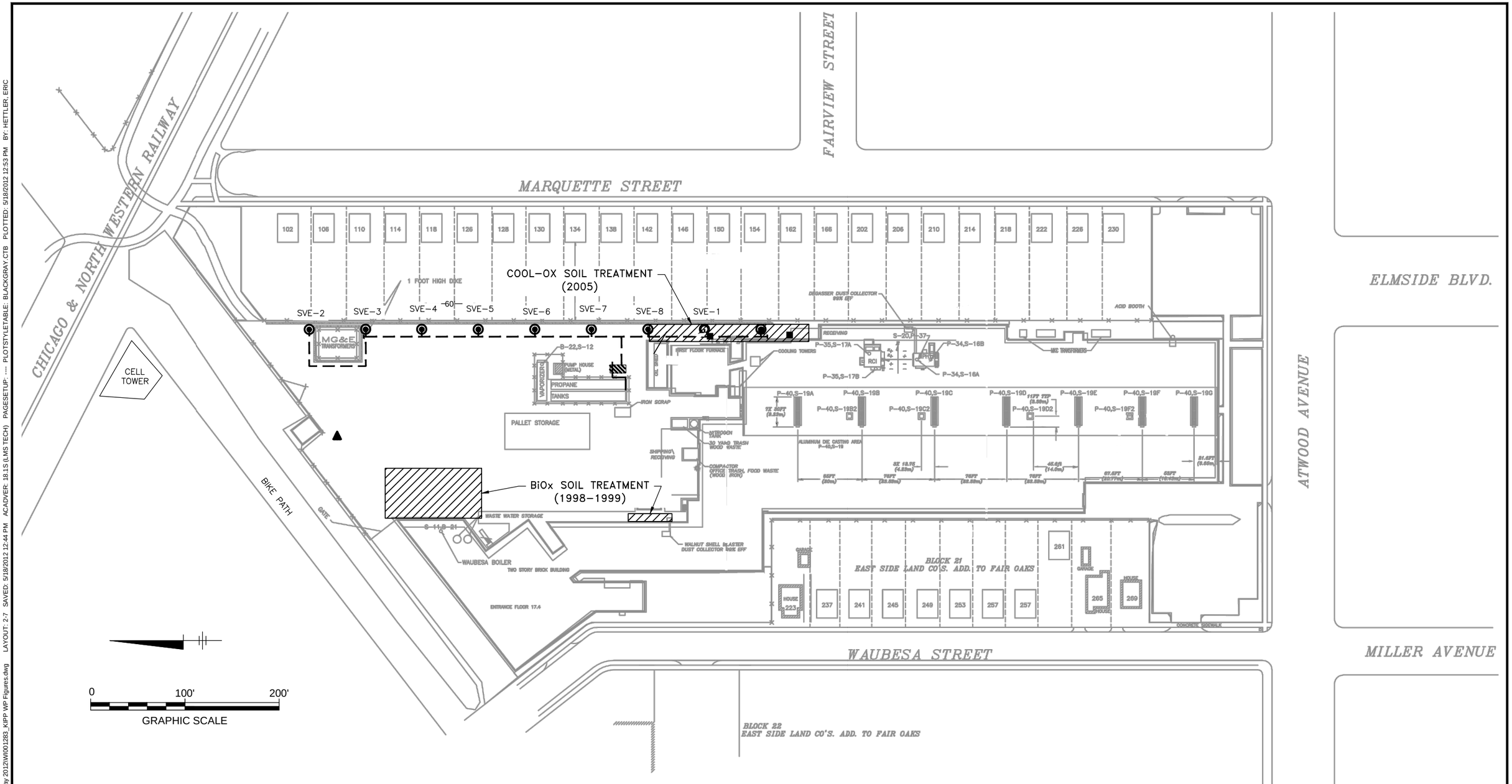
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

GROUNDWATER 75 - 171 FEET
ANALYTICAL RESULTS - APRIL 2012

ARCADIS

FIGURE 2-6

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: D:\GIS\Madison_Kipp\ArcMap\WorkPlanPCB\2-6_DeepPiezometers_V2.mxd



LEGEND:

- ■ OZONE SPARGE WELL
- ▨ SOIL TREATMENT AREAS
- ◉ NEW SOIL VAPOR EXTRACTION WELL
- ○ ORIGINAL SOIL VAPOR EXTRACTION WELL

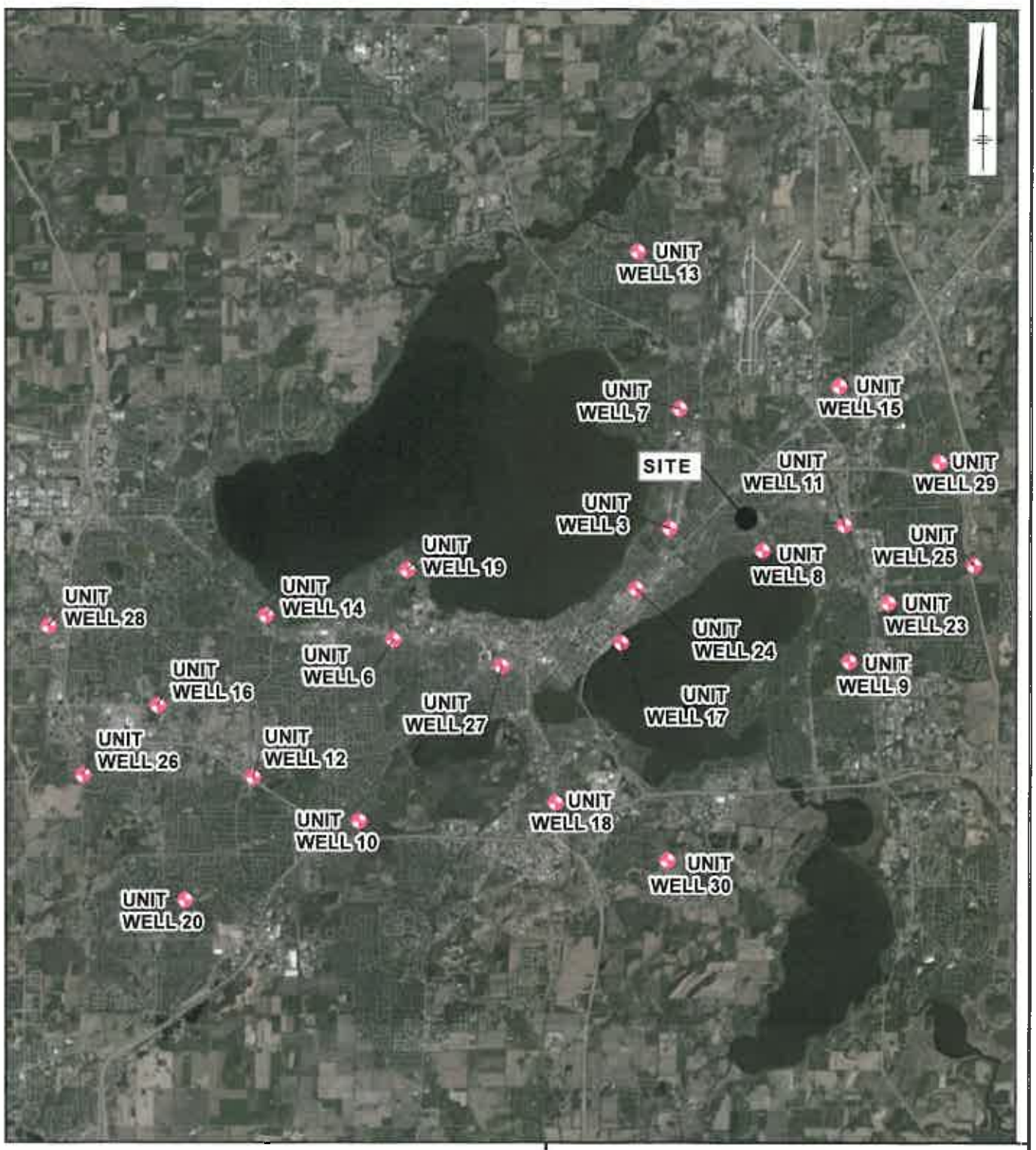
SOURCE: MADISON KIPP CORPORATION

MADISON KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

REMEDIATION LOCATIONS

ARCADIS

FIGURE
2-7



LEGEND:

Public Well

NOTES:
1) AERIAL IMAGERY OBTAINED FROM BING IMAGERY SERVICE THROUGH ESRI ONLINE MAPPING, ACCESSED ON 5/21/2012

0 1.85 3.7 Miles

GRAPHIC SCALE

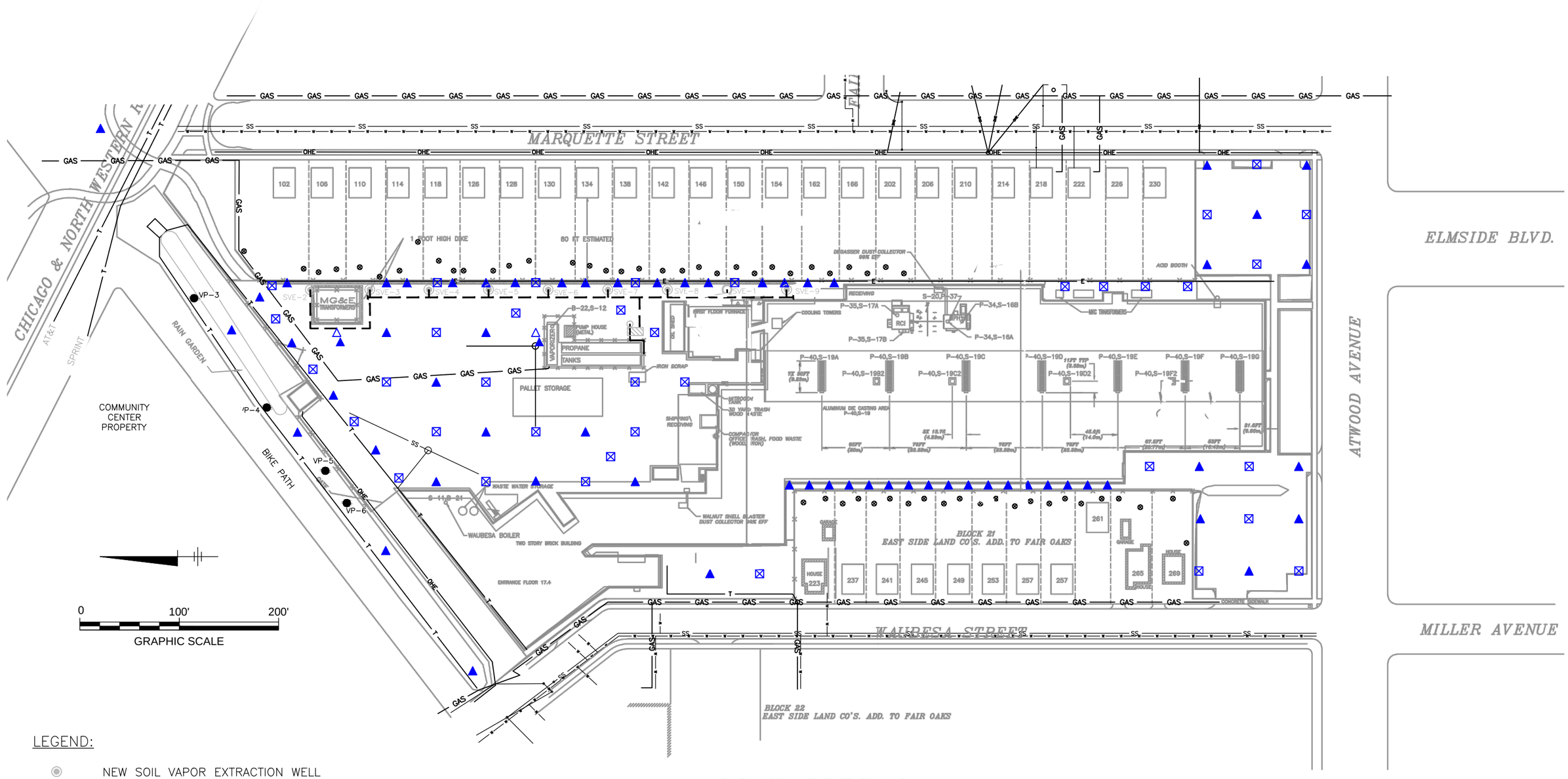
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

PUBLIC WATER SUPPLY WELL LOCATIONS

ARCADIS

FIGURE
2-8

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: E:\GIS\Madison_Kipp\Madison_Kipp\ArcMap\WorkPlanPCB\2-8_PublicWells.mxd



LEGEND:

- NEW SOIL VAPOR EXTRACTION WELL
- ORIGINAL SOIL VAPOR EXTRACTION WELL
- PROPOSED SHALLOW SOIL BORING (4 FEET)
- PROPOSED DEEP SOIL BORING (35 FEET/TOP OF BEDROCK)
- SOIL VAPOR PROBE
- SOIL VAPOR EXTRACTION SYSTEM BUILDING
- OFF-SITE RESIDENTIAL SHALLOW SOIL BORING, EXACT LOCATION TO BE DETERMINED IN FIELD

- T — FIBER OPTIC AT&T TELEPHONE
- GAS — GAS
- SS — SANITARY SEWER 8"
- W — WATER
- E — ELECTRIC
- OHE — OVERHEAD ELECTRIC

SOURCE: MADISON KIPP CORPORATION

MADISON KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

PROPOSED SOIL BORING LOCATIONS

ARCADIS

FIGURE
4-1

LEGEND:

PROPOSED PIEZOMETER

MONITORING WELL

NOTES:
1) AERIAL IMAGERY OBTAINED FROM BING IMAGERY SERVICE THROUGH ESRI ONLINE MAPPING, ACCESSED ON 5/23/2012

0 200 400 Feet

GRAPHIC SCALE

MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

PROPOSED PIEZOMETER LOCATIONS

ARCADIS

FIGURE
4-2

CITY: MPLS DIV/GROUP: IM DB: MG LD: CK
MADISON-KIPP PATH: D:\GIS\Madison_Kipp\ArcMap\ProposedPiezometers.mxd

ARCADIS

Appendix **A**

Submittal Certification

ARCADIS

Appendix **B**

Historical Site Investigation Reports

ARCADIS

Appendix **C**

Historical Remediation Reports